



Wrag Missingham
from my father

MATTHEW'S CYCLOPAEDIA
of the
HOME

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*HOW TO KEEP YOUR HOUSE
IN GOOD REPAIR*

EDITED BY
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CONTENTS

Volume II

SECTION IV

CHAPTER XXIII DECORATION

PAGE

Style—Internal decoration and painting—A typical room 1

CHAPTER XXIV COLOUR AND DESIGN

Decoration—Solar spectrum—Standard colours—Spectrum band—White and black—Harmony—Visual colour—Contrast—Colour sense—Luminosity—Application of colour—Design 13

CHAPTER XXV PAINT

Tools—Planning—Composition of paint—Properties of materials—Pigments—Raw and boiled linseed oil—Solvents or thinners—Driers—Gold size—Stainers—Producing colours—Varnishes—Enamels 28

CHAPTER XXVI PAINTING

Procedure of painting—Ceilings—Sash windows—Doors—Treatment of hard woods—Yellow deal—Pitch pine—New wood—Different finishes—Application—PREPARATION OF SURFACES—Ironwork—Repainting ironwork—Hot water pipes and radiators—Galvanized iron—Zinc—New plaster—Repainting a plaster surface—PAINTERS' TOOLS—Brushes—Metal tools—Scaffold boards—Steps, trestles and ladders—EXTERNAL PAINTING—BURNING OFF AND SOLVENTS 47

CHAPTER XXVII CAUSES AND CURE OF FAULTS

Defects and stains in plaster work—Crumbling ceilings and walls—New plaster—Keen's cement—Paint becoming soft on plaster—Paint peeling from plaster—Paint blistering on plaster surfaces—Paint losing gloss—Paint darkening on plaster walls—Repainting compo fronts—Dampness—Blistering—Knots—Painted surface losing its gloss—Paint powdering—Crumbling paint—Paint used in seaside towns—Paint cissing or crawling—Paint scaling from ironwork—General hints—Flat enamels—Stoppings—Fillings—Rubbing down—Knots—Priming—Excess of driers—INCIDENTAL REPAIRS—Metals—Plaster work—Papering over distemper—To strip old paper—Superficial treatment for damp surfaces—Stains caused by damp 65

CHAPTER XXVIII VARNISHING AND WAX POLISHING	PAGE
<i>Application—Spirit varnishes—General problems—Smoke, grease and dirt—WAX POLISHING: Stains; Wax finishes—RECIPES FOR STAINS</i>	82

CHAPTER XXIX DISTEMPER

<i>Size-bound distemper—Clearcole—Preparation of surfaces—Repairing—Application of distemper—Washable distemper and water paint—Variations of texture—Faults and hints—Consistency of distemper—Modifying distemper tints—Distempered surfaces not solid in colour—Stained ceilings—Oil-bound-distempered surfaces to be redecorated—Petrifying liquid—Gummy “tears” on water-paint surfaces—Washing water-paint surfaces—Crumbling surfaces—Treatment of stonework—Water paint applied over old paint—To remove splashes from water paint—Varnishing water paint—Water paint as a filler for plaster</i>	91
---	----

CHAPTER XXX WALL-PAPER

<i>Measurements and calculations—Tools and equipment—Trimming, cutting and pasting—Cutting the lengths—Hanging—To hang the second length—Internal angles—Hanging ceiling papers—Patterns which require centring—Panelling and cut-out schemes—“Individual” treatment—Panelling and proportion—Setting out of the panels—“Appliqué” motives</i>	103
--	-----

SECTION V HANDICRAFTS

CHAPTER XXXI WOODWORK

<i>TOOLS: Planes—Saws—Boring tools—Chisels and gouges—Marking-out tools—SHARPENING EDGE TOOLS—Oilstone—Gouge slip; Use of the stone; Scraper—SIMPLE WOODWORK JOINTS—Edge-to-edge joints—Tongued and grooved joints—Halved joint—Housings—Mortice and tenon—Haunched mortice and tenon—Common dovetail</i>	125
---	-----

CHAPTER XXXII MATERIALS

<i>TIMBER—Deal—Oregon pine—Pitch pine—HARD WOODS—Oak—Mahogany—Birch—Walnut—Plywood—Laminated wood—USE OF SECOND-HAND MATERIALS—MANUFACTURED WOOD PRODUCTS—NAILS, SCREWS AND HINGES—Fixing by screws to brick, stone, etc.—Common types of hinges</i>	152
--	-----

CHAPTER XXXIII AMATEUR CARPENTER'S WORKSHOP AND ITS EQUIPMENT

<i>FITTING UP THE WORKSHOP—Bench—Sawing stool—Cramps—Bench hook—Mitre block—Glue</i>	162
--	-----

CHAPTER XXXIV BUILT-IN FURNITURE AND FITTINGS PAGE

Using the recess by the fireplace—Cupboard for the dining-living-room—Built-in book shelves—Window seat—Dressing-table built in to bay window—FITTINGS FOR THE KITCHEN—Fitted shelves—Tradesmen's delivery hatch—Collapsible table—Light clothes airer—Kitchen storage fitment—Draining boards and cupboards—FOUR USEFUL THINGS TO MAKE—Household steps—Wooden curb—Floor standard electric lamp—Pendant electric fitting 169

CHAPTER XXXV METALWORK

Use of second-hand materials—Metals—Cast iron—Steel—Tinned plate—Brass—Copper—Zinc—Aluminium—Tools—USE OF TOOLS—Filing—Chisel—Hack-saw—Drilling—Soldering 206

CHAPTER XXXVI UPHOLSTERY AND SOFT FURNISHINGS

General tools—Special needles—Foundation materials, etc.—Padding and stuffing materials—REPAIRS—Sagging webbing—Broken springs—Hessian cover—Loose trimmings—CARPET REPAIRS—Joins—To patch a hole—A weak join—Borders and diagonal joins—LOOSE COVERS—Choice of materials—Measuring a chair—Cutting out—To fit and make up—For the car—LOOSE UPHOLSTERED CUSHIONS—Materials required—Fillings—Measurements—Cutting out—To make up the ticking—To fill—Blind stitching—Tufting—To make up the cover—Wall cushions—Upholstered cushions for chairs—SOFT CUSHIONS—Foundation materials required—Choosing the shape—Making the pad—Covering materials—Round cushions—Head cushions and pads—Appliqué—Quilting—POUFFES—Materials required—Stuffings—Making a pattern—Making a pad—The cover—PELMETS—Materials required—Making the pattern—Cutting out—Making up—Repairs to pelmets 224

SECTION VI THE GARDEN

CHAPTER XXXVII GARDEN PLANNING

GARDEN PLANNING—Survey—Planning—Formal garden—Informal garden—Special gardens—GARDEN CONSTRUCTION—Setting-out—Levelling and gradients—Site drainage 251

CHAPTER XXXVIII MAKING THE GARDEN

Path foundation—Stone slabs—Crazy paving—Pre-cast slabs—Making concrete slabs—Concrete paths and drives—Tarmacadam—Steps—Terraces—Planted walls—Boundary walls—Ornamental walls—FENCES, GATES AND HEDGES—Open fences—Close-boarded fences—Preservation of timber fences—Reinforced concrete fences—HEDGES—Preparing the ground—Hedging plants—Planting—GATES—Single gate—Pair of gates—Piers—Gate fittings 268

CHAPTER XXXIX FURNISHING THE GARDEN	PAGE
GARDEN FURNITURE AND SUMMER HOUSES— <i>A garden bench—A garden seat—A garden table—Rustic furniture—Building a summer house—Arbours—Pergolas—Trellis work—Arches—SUNDIALS AND BIRD BATHS—Pedestals—Bird baths—Ornamental figures—BIRD BOXES AND TABLES—Nesting boxes—Bird tables—Pigeon and doves—GARDEN POOLS AND PONDS—How to construct a formal pool—Lily pond—INFORMAL POOLS—Fountains</i>	294

SECTION VII

CHAPTER XL MISCELLANEOUS

COOKING RANGES— <i>Portable ranges—Combination grates—Heat storage cookers—Back-to-back grates—LINOLEUM AND RUBBER FLOORING—Laying linoleum—Guarding against rot—Laying rubber—CARPET LAYING AND CARE—Fitted carpets—Carpet squares and rugs—Stair carpet—Care of carpets—Stains—FLOOR AND WALL TILING—Hearth tiling—Fixing wall tiles—Special tiles—Loose tiles—Tiling on wood partitions—VERMIN, PREVENTION AND DISINFECTION—Importance of cleanliness—RATS AND MICE—Structural measures—Rat destruction—INSECTS—Insecticides—Bed-bugs—Flies—Moths—Flies—Cockroaches—Ants—Crickets—Wasps—DRAUGHTY ROOMS—Gaps and crevices—Draughty vents—Screens and porches—Effect of the grate—Draught excluders—MOWING MACHINES—Hand-operated—Roller mowers—Power-operated—USE AND MAINTENANCE—Sharpening—HOW TO MAKE A GARDEN ROLLER—POULTRY BUILDINGS—SMALL POULTRY HOUSE—Span-roof poultry house—Covered run—CONSTRUCTING A GREENHOUSE—Floor—Sides—Ends—Roof—Lean-to greenhouse—COLD FRAMES</i>	313
---	-----

APPENDIX

<i>Inspection and maintenance charts—Exterior—Interior—Kitchen—Bathroom and plumbing—Oiling—Maintenance tools—Nails and screws</i>	375
GLOSSARY	401
INDEX	412

LIST OF BLACK AND WHITE PLATES

To be found following page 312

PLATE

- I A Small sunk garden
 B Rubble wall planted with rock plants
- II A Pedestal built of bricks and stone
 B Steps of pre-cast concrete
- III A Semi-circular steps during construction
 B Semi-circular steps and terrace completed
- IV A Making shallow pools
 B Finished pools
- V A Terrace and steps
 B Low wall to flower border
- VI A Making a pre-cast concrete slab
 B } Shaping and laying crazy paving
 C }
- VII A } Making concrete path
 B }
- VIII A Concrete gate posts
 B Pre-cast concrete fence

LIST OF COLOUR PLATES

To be found following page 16

PLATE

- I Spectral colours
- II Complementary colours
- III Tints and shades
- IV Forms of harmony
- V Simultaneous contrasts
- VI Two harmonious decoration schemes
- VII Decoration scheme for a bedroom
- VIII Decoration scheme for dining room

SECTION IV

DECORATION

CHAPTER XXIII

STYLE

A brief consideration of style in decoration through the four centuries that cover its history in England resolves itself chiefly into a consideration of three kinds of wood—oak, walnut and mahogany. The history of interior decoration is limited to a period of four centuries, the sixteenth to the nineteenth. Before the sixteenth century the standard of education, social comfort and domestic convenience was very low. On the other hand, by the middle of the nineteenth century interior decoration had deteriorated into the production of Victorian designers who were turning out meaningless and dead imitations of past styles, and using vulgar German patterns introduced at the time of the Great Exhibition of 1850.

The end of the feudal system gave Englishmen an opportunity of turning their minds towards a system of life that would enable them to live in greater comfort, and in surroundings of greater beauty. Elizabeth's reign saw the evolution of rooms *intended* for definite purposes; there is no apartment in the present-day home that has not its Elizabethan prototype. In the latter part of the fifteenth century oak panelling was introduced to hide the rough finish of masonry, the first

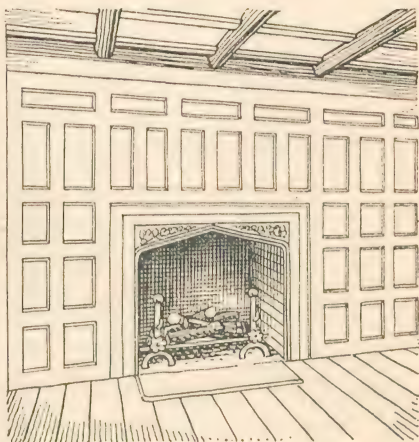


FIG. 1. TREATMENT OF FIRE OPENING
IN EARLY TUDOR TIMES

kind being "linenfold" panelling, introduced into England from Flanders, and bearing an obvious resemblance to a folded napkin. The panelled motives possess fascinating possibilities in the discreet distribution of carved oak ornament. In the fifteenth and sixteenth centuries wall linings were chiefly treated in this way, and the ceilings of the period are finely modelled

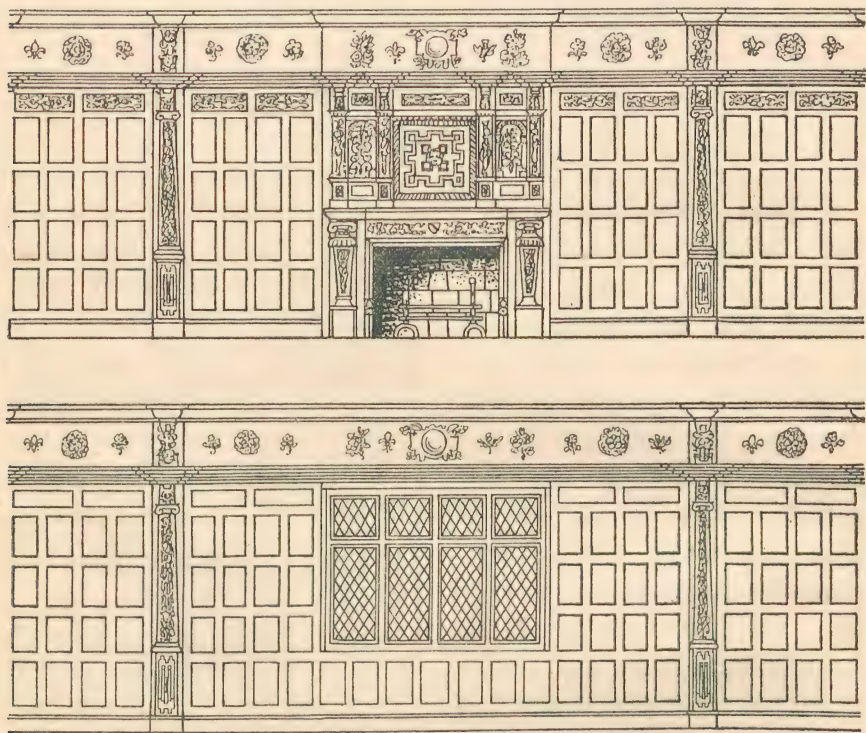


FIG. 2. INTERIOR ELEVATIONS OF TWO WALLS OF AN EARLY SEVENTEENTH-CENTURY ROOM IN WHICH THE FIREPLACE RECEIVES DEFINITE ATTENTION

The wall panelling is divided into bays by pilasters though not strictly in accord with classic tradition they reveal a definite trend toward architectural form

with natural forms bound together with traditional Elizabethan strapwork. The end of Elizabeth's reign witnessed an extraordinary advance in craftsmanship. Panels exhibited mitred mouldings; the simple "linenfold" and gentle tracery of the Gothic period disappeared, and were replaced by a more vigorous style. (The Bromley Bow room in the Victoria and Albert Museum is an excellent example of this period.) The end of the "period of oak" tallied with the beginning of the Jacobean period. Though very distinct in character, it shows a deterioration in its variation on the Elizabethan themes. The carving

which was typical of the latter period was direct; Jacobean art was merely applied. It is interesting to note that chairs came into more general use in the time of James I.

The development of both the home and its equipment was continued during the reign of Charles I. Panels became larger, and the dado rail became a definite feature designed to give a horizontal line to the room. The whole was crowned by a cornice of five or six members. In contrast with earlier work, these panels were no longer recessed below the stiles and rails, but were raised above the general level of the wall and framed by heavy bolection mouldings. In its ornament Elizabethan work had chiefly relied for its inspiration upon Dutch and German models, and these, though efficient, lacked true refinement. Sir Christopher Wren, Inigo Jones and other architects of the Carolinian period introduced a scholarly influence on design, and ornamental detail became classically pure. The revolution which culminated in the Commonwealth brought about a change to simpler living. But the period was not of sufficient duration to affect interior decoration.

The popularity of oak gave way to that of walnut, which lasted from the reign of William and Mary until that of George I. It continued to be in fashion until the advent of mahogany, coupled with the discovery that walnut was prone to the attack of the worm. In the last quarter of the seventeenth century there was transition from Jacobean to Dutch models—probably the most important change that has ever modified the designs of English furniture. Ceilings of the period were still treated in relief, and were decorated with bands of mouldings which framed oval or circular panels of definite architectural arrangement. The eighteenth century saw a reversion to the old idea of treating the ceiling as one large surface, and it was covered with ornament in low relief. As the century progressed, ornamental detail in interior decoration became more refined and simple. The height of this refinement was reached in the work of the brothers Adam. Their influence was immense and far reaching. They were architects and interior decorators, and it is quite certain that much of the furniture made by Chippendale and Hepplewhite was designed by the brothers. They changed the boldness and vigour imparted to ornament through the influence of Wren and Vanbrugh, and replaced it by a delicacy and refinement

imported from France and resulting largely from a study of the villa residence of the Emperor Diocletian erected in A.D. 305.

With the advent of the work of the Adam brothers wood as the material for lining walls was no longer employed, plaster replacing it. The chimney-piece ceased to be an integral part of a panelled scheme, and was treated as an isolated feature. The fire grate succeeded the open hearth. All that remained of the more ornamental treatment of past times was the dado.

Although wall-paper had occasionally been used in bedrooms in the first half of the eighteenth century, it was not until the Adams period that it came into general use in the main living rooms of houses, where it formed a better setting for the new simplicity and the low relief of ceilings and plaster panels than the heavy dark woods in previous use. The brothers Adam, as already stated, were the first architects to undertake the complete job of interior decoration; with them, architecture proper, interior design and fittings and furniture were treated as a collective and an integral whole. Hitherto, furniture designers, including the great Chippendale, had worked to their own designs, and made furniture without any relation to the interiors which were going to provide its settings. It was no special knowledge or love of furniture that led Robert Adam to make his own designs, but a desire to give his exteriors and interiors an all-round completeness inevitably absent from existing models of furniture. A revolution had been effected, and the history of English decoration thereafter until the year 1820 is simply one of the evolution of a style already established. In furniture, Sheraton and Hepplewhite, both cabinet-makers, corrected defects and perfected designs already in existence; in architecture and interior design the peak of elegance and simplicity was reached with the Regency period. The fall of the monarchy in France in 1793, followed by the simple and graceful designs characteristic of the first Empire and successors to the florid designs of Louis XIV further influenced English taste, and led to the classic simplicity of the Regency period in England. With the banishment of wood, colour acquired a fresh importance, and from about 1750 until the end of the Regency it was employed with exquisite taste and effect. The colour-schemes of that period, in cream, in conjunction with green, gold and Wedgewood blue, are extremely beautiful, and, incidentally, interestingly akin to the "off white"

schemes evolved by interior decorators from 1820 to the present day.

The Victorian era is so close to our own times as to make any review of it difficult. It has the aspect of an age so distracted by the violent social changes resulting from the Industrial Revolution that it had no time to concern itself with artistic progress. The designs of previous periods were plagiarized and exaggerated; perhaps the best that can be said is that the work produced, though all too frequently lacking in taste, was solidly made by sound craftsmen.

Consideration for internal decoration and painting

Figs. 3, 4, 5, 6, offer suggestions where schemes of decoration are enhanced by the control of the architectural form.

Personal as well as practical considerations enter into any scheme of internal decoration. Inevitably the tenant, owner or otherwise, is bound to see more of it than anyone else, and he is the best person to carry out a scheme sympathetically. There is no practical reason why every man should not be his own decorator. Good taste, and a capacity for aesthetic appreciation, are not so rare as they are assumed to be, and I believe that most people have a love of colour which they could develop by education.

My purpose in this short article is simply to offer suggestions

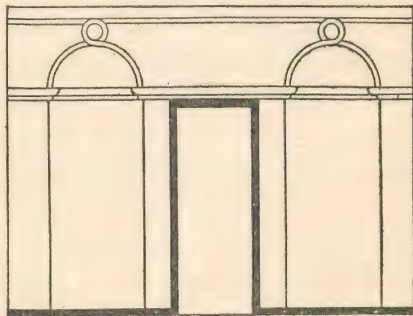
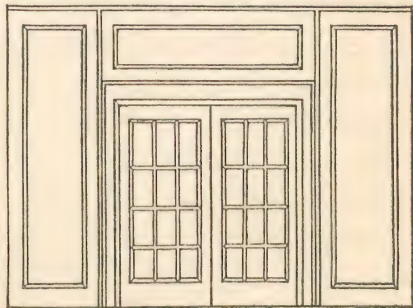
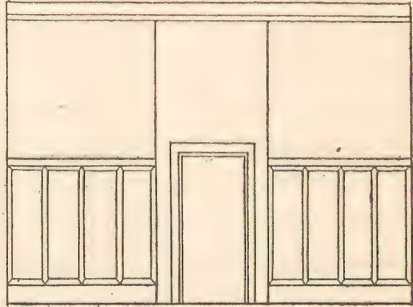


FIG. 3. ADJUSTMENT OF WALL SURFACES

This may be determined by the arrangement of furniture or the introduction of coloured hangings, or may depend upon the discreet placing of integral features such as doors and windows, etc. See also Fig. 5, p. 9

which can be developed to suit personal needs and serve as a general guide.

One of the first principles of internal decoration is concerned with tonal values, in other words, the relationship of light and dark in colours. The ceiling should be the lightest part of the room. The walls should be sufficiently darker than the ceiling to convey an effect of supporting it, while the floor should be the darkest feature of all, because it constitutes a base. If this order is adhered to, an effect of stability will be maintained. Most rooms should be planned to provide a focus for the eye, which would be distracted if several dominant features were set up in one room. In most rooms this focus is the mantelpiece, though in a dining room it might be the table itself. The rest of the room must be subordinate to this focal point. The furniture and fittings must support and complete the whole.

During these post-war years there has been, and still is, an acute shortage of labour and materials, which is likely to persist for a number of years to come. This economic condition will impose simplicity upon any present-day schemes of decoration and this is all to the good. The need for economy in labour, together with our increasing understanding of hygiene, has ousted unnecessary elaboration. Old rooms which it is intended to redecorate can easily be adapted to up-to-date standards. To begin with, all superfluous ornamentation should be eliminated where possible. Where, for example, a moulded cornice cannot be removed, it can be masked with a plain sloping cover of wood. A fireplace spoilt by ugly tiles, or ironwork, can be transformed by covering it with a panel of plain wood or sheet-metal.

Dealing with a typical room

With regard to the problems connected with any definite colour-scheme, let us deal with a typical room of about fifteen feet square. Assume that it contains a few pieces of mahogany furniture, bronze-green curtains, and a grey-green carpet. Furnishings of this type would be difficult and expensive to change, and therefore the redecoration of the room must be restricted to the painting of the walls and woodwork. Our problem is to relate the new colours to the existing features of the room. One solution of this problem would be to fall

back upon a selection of neutral colours associated with the existing colour-units of the furniture, carpet and curtains. In so doing, advantage is taken of the principle of rhythm in colour,

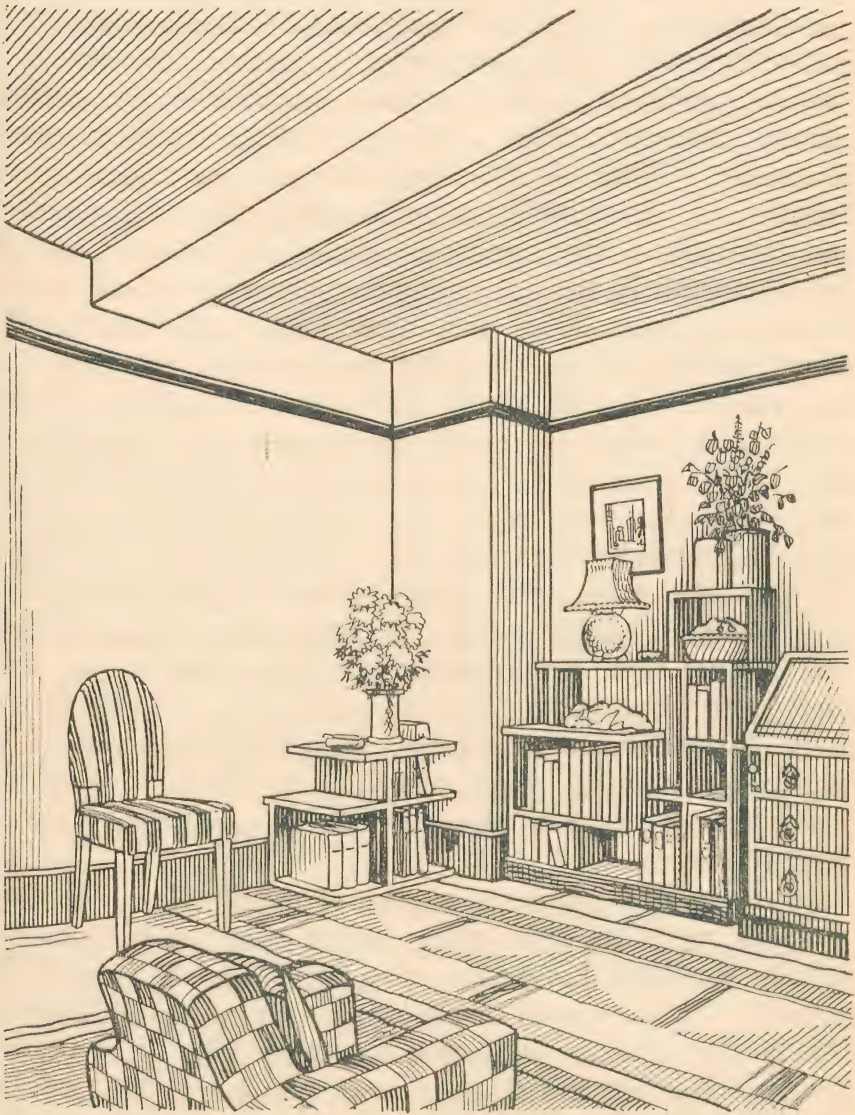


FIG. 4. SKETCH FOR A SMALL SITTING ROOM IN A MODERN FLAT. SENSE OF SPACE IS CREATED BY SIMPLICITY IN ALL UNITS. STRUCTURAL ELEMENTS ARE ACCEPTED
The ceiling is treated in azure blue—walls are a light beige. The frieze rail and skirting are of a deeper blue, which is also echoed in the furnishings creating the necessary rhythm and continuity of interest required to bind the scheme

i.e. the casual movement of one colour, usually a dominant one through a scheme. In this instance the rhythm will be supplied by the recurring note of the red-brown furniture distributed

through the room. The carpet, being a dark green-grey, will be almost complementary to the furniture and consequently enhance the colour value of them both, while the green curtains should constitute a slight discord. The factor of discord is of great importance, since it is the element which relieves monotony and adds the necessary stimulant to a scheme. Discords may only be introduced in small quantities, otherwise the stimulating element deteriorates into a state of restlessness which causes discomfort. When all this is grasped, the new colour can be decided on. The problem is one of tonal values. The colour and the tone of the carpet are fixed; the walls, as already stated, must be lighter, the ceiling the lightest part of all. Tone decided, the exact colour must be decided. A decision on this point can only be reached after the aspect of the room has been studied. A room facing north will not receive any direct sunlight, an eastern or western aspect will receive the morning light, while a southern aspect means a flood of sunlight all day long. The glow that a room receives direct from constant sunlight renders very warm colour-schemes unnecessary; a northern and consequently sunless aspect requires compensation by the introduction of warm colour. Whether rooms facing east or west require such compensation depends on their use. One facing east which is used as a bedroom or a kitchen will not particularly require the warming influence of colour, because it receives direct sunlight in the morning, the period during which it is most used. The colour-scheme for any room is dependent on these factors.

To return to a particular scheme of redecoration. Because the red-brown of the mahogany is a shade of orange-red (orange-red plus grey) it will associate with a green-blue which has been greyed. The grey-green of the carpet will harmonize happily with shades of orange-red or purple-red. The green of the curtains, because it is a shade of green plus orange-red, will be sympathetic to the existing colour of the carpet. Also in the field of possibilities are the constituents of these colours, orange yellow, blue or buff. An examination of these colours will make it evident that the green carpet will produce an uncomfortable effect in relation to green walls, and one, even more uncomfortable, with blue walls.

Although many people possess an intuitive knowledge of

which colours may happily be paired, it may be useful here to reiterate the fundamental principle of colour harmony. It is based on the fact that the *constituents* of a colour produce harmony.

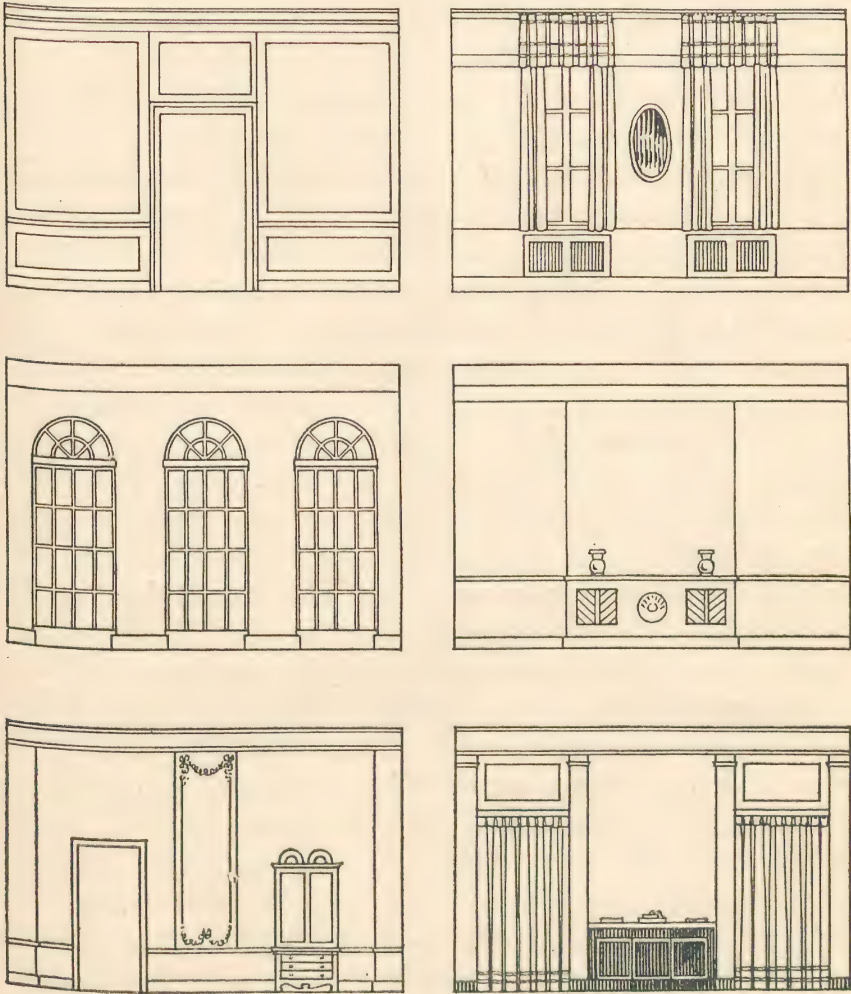


FIG. 5

More examples of the adjustment of wall surfaces

Thus, green is composed of blue and yellow, and both the blue and the yellow may be used to produce a harmony with green. Since in this case the curtains contain more yellow than blue in their mixture, yellow could be used as a harmony. Similarly, red would harmonize with the furniture. Orange, the combination of these two harmonizing colours, would be too positive, and emphasize the green too strongly because it is too close to the

through the room. The carpet, being a dark green-grey, will be almost complementary to the furniture and consequently enhance the colour value of them both, while the green curtains should constitute a slight discord. The factor of discord is of great importance, since it is the element which relieves monotony and adds the necessary stimulant to a scheme. Discords may only be introduced in small quantities, otherwise the stimulating element deteriorates into a state of restlessness which causes discomfort. When all this is grasped, the new colour can be decided on. The problem is one of tonal values. The colour and the tone of the carpet are fixed; the walls, as already stated, must be lighter, the ceiling the lightest part of all. Tone decided, the exact colour must be decided. A decision on this point can only be reached after the aspect of the room has been studied. A room facing north will not receive any direct sunlight, an eastern or western aspect will receive the morning light, while a southern aspect means a flood of sunlight all day long. The glow that a room receives direct from constant sunlight renders very warm colour-schemes unnecessary; a northern and consequently sunless aspect requires compensation by the introduction of warm colour. Whether rooms facing east or west require such compensation depends on their use. One facing east which is used as a bedroom or a kitchen will not particularly require the warming influence of colour, because it receives direct sunlight in the morning, the period during which it is most used. The colour-scheme for any room is dependent on these factors.

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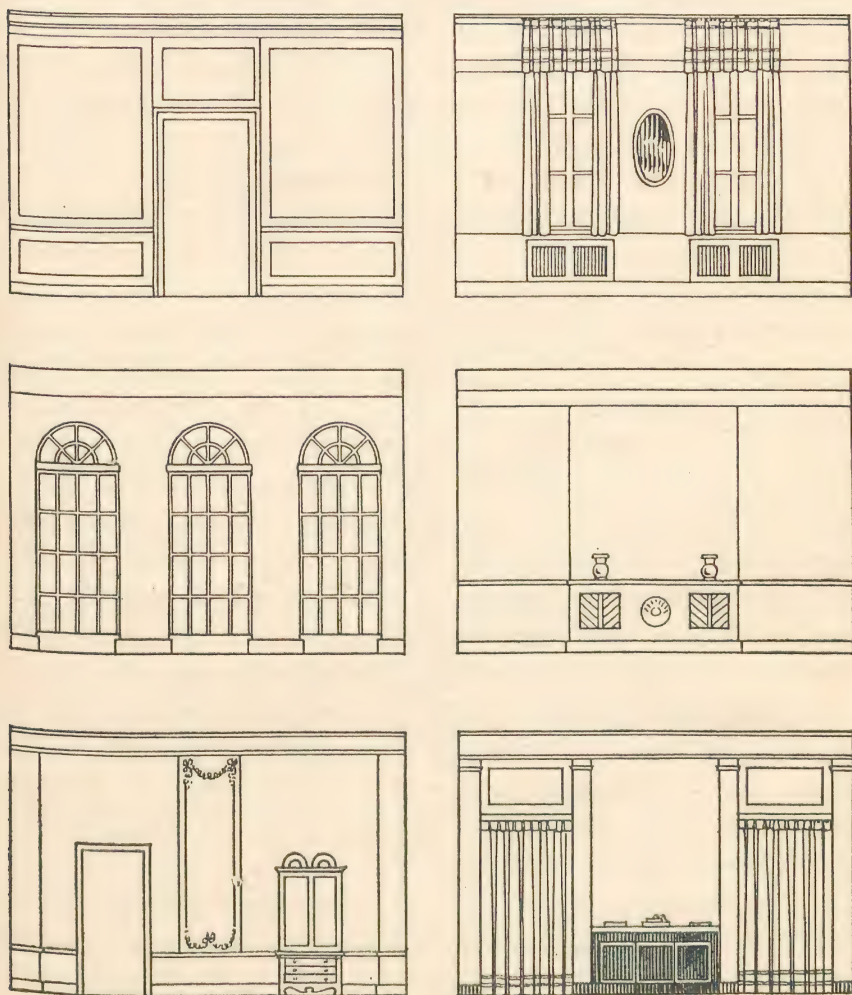


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complement. The final colour will be found by taking a middle path, primrose yellow, orange grey, buff and a little white. The result will be a warm sunshine yellow in which there is sufficient buff to prevent an appearance of sickliness, and sufficient white to produce the tone, or key, of lightness necessary. If a harmonious grey-green were required for painting the wood-work, skirtings, architraves and picture rails, it could be produced from a mixture of emerald green, violet and white.

The problems of tone and colour solved, it only remains to review the practical problems which arise. It has been decided that this scheme shall be in a light key, and the colour used will require a white base. It will be a white bulk stained with pigments to produce the colour selected. The "finish" desired must be decided upon, and a choice made from gloss paint, a varnished surface, or a "matt" finish. In the case of the wood-work, the practical consideration of cleanliness suggests the use of gloss paint or varnish, rather than a matt finish. The architectural features which surround doors and windows collect dirt and grease, and these, as well as finger-stains, are easily removed from gloss paint or varnish with a damp cloth. The harder finish is not, however, required for the walls. Generally speaking, large surfaces are more pleasant when treated "flat."

Another consideration which governs the use of gloss or matt surfaces for wall spaces is the amount of light required for a room. A matt surface not merely adds nothing to the lightness of a dark room, but actually absorbs light. A glossy surface reflects light, and though it can lighten a dark room, it may prove a disadvantage by creating glare in a room receiving direct sunlight. Flatted paint provides both quality and texture for walls and ceilings, and in conjunction with gloss paint gives relief and contrast.

In mixing your paint, exactitude is essential in judging the amounts if correct harmony is to be preserved. The grey-green should be almost the colour of bloom upon fruit; the nearest description is lavender green, light in tone. If the result of your mixing should be too garish, it will require adjustment with purple to neutralize or grey the colour. The colour indicated for the walls should be made from white and black, to which a very small amount of crimson lake or vermilion has been added. This last colour-blend requires great care in

mixing, because it is so easy for the effect to appear dirty, and even a suspicion of dirtiness entirely ruins the effect. All colours should be tried out in small quantities before they are mixed in bulk.

The same principles of colour-analysis can be followed in arriving at any colour scheme. A careful study of the article on colour theory should precede any final decision. It should be understood that colours depend for their successful harmony upon the quantities used. Richly saturated colours should only

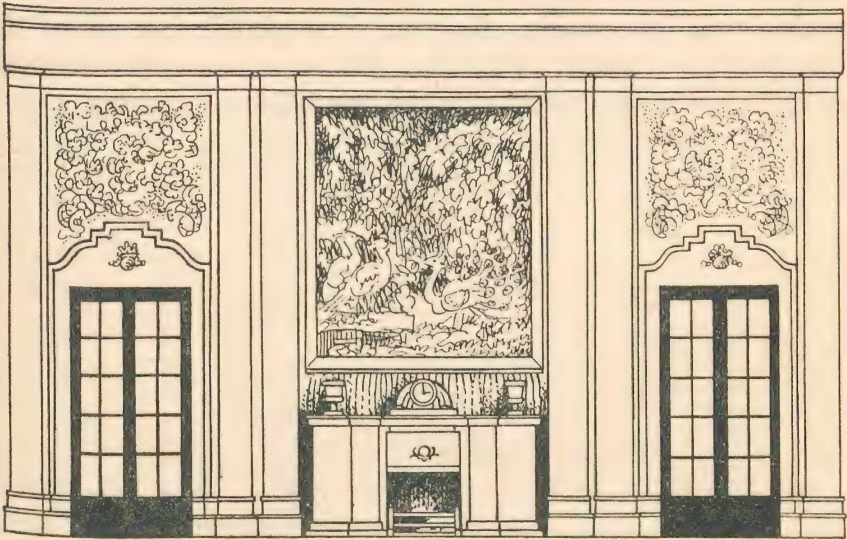


FIG. 6. SCALE AND FOCUS OF WALL SPACE

The focus of the wall is secured by the panel over the fire opening. The height of the doorway gives human scale relationship to the height of the room

be used in small quantities, as they are usually more pleasant when they are induced in grey. Vermilion, royal blue and the rich green known as viridian are of this order. The need in most English houses is for an abundance of light, and consequently the masses of colour usually used in decoration will be mostly light tints. The pure or positive colours which provide the complementary note must, by the same token, be employed in small patches only—in small pieces of pottery, table lamps and flowers, which enrich the general harmony of a complete scheme.

To end this analysis of a typical colour-scheme, it may be as well to recapitulate some general principle of colour. A colour scheme is best obtained by the use of a strictly limited group of colours, and harmony is dependent on their interplay. The use

of colour requires an appreciation of its effect upon the senses; red is exciting, yellow less exciting but stimulating, while greys and cool browns act as sedatives. When large expanses have to be dealt with, tones should be quiet and softly blended. Strong colour should only be used in small quantities. The final effect of any colour depends upon whether it is painted on a smooth or rough surface. Colour applied to rough plastered walls can afford to be purer in hue than colour painted over a smooth paper.

Interior decoration may on the one hand involve the remodeling of a whole room, or it may extend no further than a few modest and inexpensive changes. Few people can afford the luxury of an architect or interior decorator, but everybody can make a start in correcting existing unsuitable conditions.

CHAPTER XXIV

COLOUR AND DESIGN

Decoration

A successful colour scheme can only be achieved by arriving at a proper balance and harmony among the many units which play their part. Fixtures, furniture and furnishings are all concerned, and can make or mar a colour scheme. Frequently sheer instinct enables people with no pretence whatever to "artiness" to create combinations of colour which are completely satisfying.

Colour can have a considerable effect on people's moods and tempers. Some colours are soothing, others irritating, and the rules which govern their arrangement should form the basis of any scheme from its general lay-out to the final details. Harmony, rhythm and balance are those factors which are most essential.

What *is* colour? This question was answered by Sir Isaac Newton in 1672. By passing a ray of white light through a triangular glass prism, he caused the light to be separated into its component parts. These parts, displayed upon a white screen, registered the six primary colour sensations, violet, blue, green, yellow, orange and red.

The solar spectrum

Plates I-VIII referred to in this chapter will be found following p. 16.

In order to make an intelligent use of colour, a working knowledge of its theory and relationship is essential. Our purpose will be served by the acceptance of six primary colours as displayed in the solar spectrum. These colours are, for the convenience of reference, set out in the colour-wheel. (See Plate I.) It was at one time thought that the secondary colours, orange, green and violet, resulted from the overlapping of the red, yellow and blue band. We are, however, including these among the six essential colours which constitute our

colour scale, and form our index for finding true relations and colour values. The establishment of this scale, which exemplifies the purity and saturation of any normal colour, also allows us to identify *any* colour sensation. All other colours are formed from combinations of these primary colours, and the pigments, or paints which science has devised to include as widely as possible the whole colour-scheme have their own standardized names and significance.

Standard colours

A standard colour, selected from the scale of the solar spectrum must possess certain qualities. First, hue, by which its identity is established; secondly, freedom from adulteration by the admixture of any other colour; thirdly, luminosity, or its capacity for reflecting light to the vision. This last is a quality which varies with each colour.

What must be clearly realized is the difference between colour, as exhibited in the spectrum, and paints, or pigments, which represent the best efforts of the manufacturer to reproduce those colours. Only by experience can the artist hope to bridge even partially the bridge between colour in its narrow and technical sense and pigment.

The spectrum band. Plate I

Upon examination, the spectrum band will show a number of unequal divisions, or strips of varied colour. These divisions represent the actual amounts of saturation displayed in each individual colour. The change from one standard colour to another, being gradual, shows the extent to which one colour impinges upon its immediate neighbour. Only at a point beyond which maximum saturation has taken place is the essential or "standard hue" indicated. The illustration, Plate I, shows orange as a fully saturated hue between yellow and red, and above the orange can be seen red-orange and below orange-yellow. Two examples of this are given in the plate, with intermediate narrow strips lying between the fully saturated hues. (See also Plate II, where these intermediates are used to enlarge the colour-wheel to twelve essential hues, and very usefully enlarge the number of colours on the artist's palette.)

White and black

Both these are listed as pigments and are included in colourmen's lists. So far as the spectrum is concerned, white light, as already indicated, results from the union of all colours, and black, the entire absence of any light whatever. To the colourist, they are means of varying and adulterating pure colours.

Tints and shades in Plate III demonstrate the use of black and white, and their application in conjunction with the six standard hues of the spectrum. These examples give first, tints, which have been produced by successive additions of white to each of the standard hues, the latter being displayed in the top line with each colour being extended downwards. The second batch of examples shows the process of adulteration resulting from the addition of black. Again the top line is the standard hue which is extended downwards in a succession of shades, each of a lower tonal value.

Adulteration by either of these methods has practically unlimited possibilities. As the intensity of saturation changes, the original luminosity of any colour will of course be changed too, and its hue ceases to be "standard". So far as this volume is concerned, any future reference to "shade" will imply that a colour has been adulterated with black pigment, and to "tint" that white pigment has been added. Wherever variation of tone is required in a particular colour-scheme, it will be found that this method offers the most practical assistance in finding the requisite tone and colour. The Plate gives some idea of the opportunities that exist for variation, and of how wide the choice of colour may be, varying, as it does from deeply saturated hues to off-white tints.

Having accepted the principles involved in the spectrum, let us examine some of the physicists' theories. These will assist to relate the production of pigments (paints) to the colour-sensations emitted in white light. It has been proved that objects having no colour in themselves possess the capacity to reflect waves of light. The actual colour is dependent upon the height and length of the wave. Red, for instance, has a ratio to orange as 7:5-9, while the ratio of the shortest, violet, is 4:7. Pigment, that is, the actual substance from which paints and dyes are manufactured, must possess certain qualities. Should blue be required, the pigment must absorb all other

waves from the white light (by which we are able to visualize it) except those which respond to blue. This process is known as absorption.

Pigments (paints) are not manufactured under names which supply the necessary clue to their identification in the standard colour scale. By their comparison with the scale their identity can be easily established. In cases where modification is necessary, in order that sensitive schemes of harmony can be made, colour must be subjected to these methods of standardization. Their identification can then be easily achieved.

In pigments:—

Standard Red	.	.	.	Equals a mixture of vermilion and Crimson Lake.
Orange	.	.	.	A mixture of mid chrome and ver- milion.
Yellow	.	.	.	Aureolin yellow.
Green	.	.	.	Aureolin yellow and viridian.
Blue	.	.	.	French ultramarine blue.
Violet	.	.	.	Cobalt blue and crimson lake.

Artists' colourmen have of recent years recognized the importance of standardized hues.

Harmony

Harmonious colour-schemes have a beneficial reaction upon the nervous system. Harmony is controlled by the inter-relation of one colour to another. The colour-wheel has been so arranged that it demonstrates this relationship, and establishes the scale of saturation and hue in normal colours. Modification of these may then be arrived at by further experiment. For example, should the colour under consideration be red, it is necessary to know precisely what *kind* of red—for instance whether it is the red of a flower pot, of blood, or the red on the Union Jack. The decorator, using his standard scale, can discover just what modification the standard hue requires to produce the colour he desires.

It may be found that tonal values (the intensity of saturation) are too strong. In this case they will need to have the scale reduced. This result, as already indicated, is achieved by adulteration, the addition of white to the normal colour until it

6 ESSENTIALS



EXTREMES
OF ORANGE

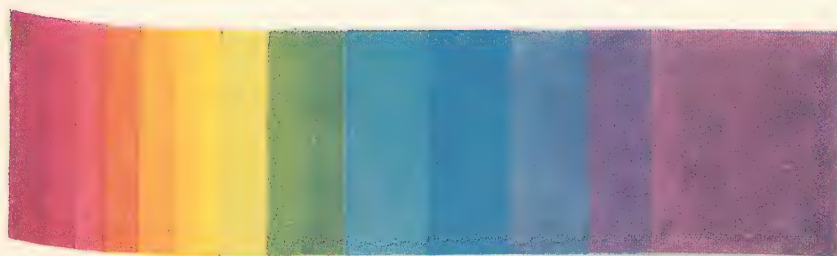


EXTREMES
OF YELLOW.

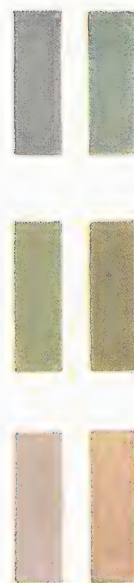


SPECTRAL COLOURS.

SPECTRUM.
BAND



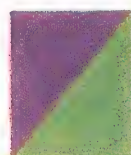
COLOUR WHEEL. 12 COLOURS



GREYS.

4

GREYED COLOURS



COMPLEMENTARIES

3

FORMS OF HARMONY.



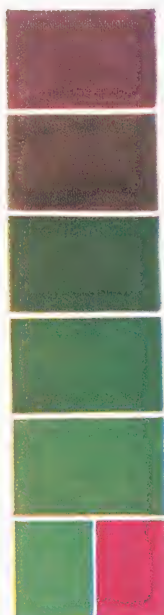
MONOCHROMATIC
HARMONY



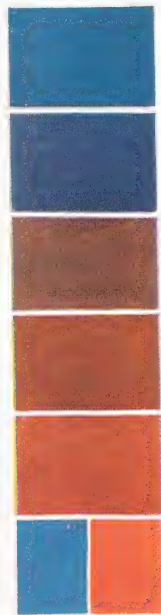
ANALOGOUS
HARMONY



COMPLEMENTARY
HARMONY



3

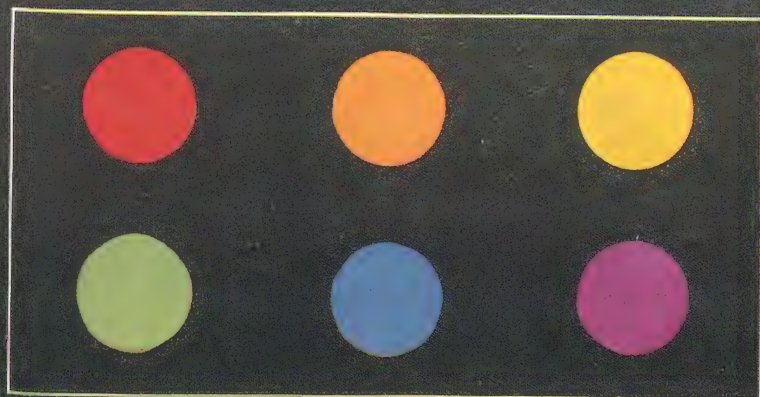


3

NEUTRALIZED BY COMPLEMENT.



NO 3 EXTENDED BY WHITE.



CONTRASTS SPECTRAL COLOURS.



Simultaneous contrasts produced by the induction of the spectral colours upon black, grey, and white. The tonal and chromatic value of a colour is affected by the nature of its background.





Top—A small scheme for a complementary harmony.
Below—A scheme for an analogous (or related) harmony.

Harmony, when applied to simple decoration, may be secured by the careful choice of furnishings and decorative details.



This scheme for the decoration of a small bedroom is an analogous harmony of warm ivory and apple-green with walls of distemper or matt paint echoed slightly lighter in the ceiling. Careful arrangement of the furniture gives a feeling of space, held together by the dark grey-green carpet, the rhythm being completed by the colour echo in the rug. The small red vase strikes a gentle complementary note.

has been "lifted" sufficiently to conform to the requirements of the scheme.

Really exact and satisfactory adjustment can be achieved only by practical experiment. After any particular scheme has been worked out, disappointment in the finished work may be minimized by painting a small portion in its actual position, and thereafter changing it if necessary.

When any adjustment is desired for practical purposes, experiments should be made with small quantities of the colour, a palette knife, and a small piece of glass. These are all that are required, the actual extension being made with a very small quantity of colour mixed upon the glass. Any further variation required may be produced with the bulk of the material intended to be used for the work. The importance of neutralization in the control and production of harmony may be observed.

(1) Any colour can be neutralized by the addition of its complement. Examples of this method are shown upon Plate V. No. 3 has been further extended and gives an excellent range of greys.

(2) A singular result will be achieved by the addition of a small quantity of a selected hue to the whole range of colours proposed for use, thus procuring a neutral factor common to the whole range.

(3) This consists in using a range of colours neutralized by grey (a mixture of black and white), and these are known as broken colour. The illustration of this method is shown on Plate II.

Visual colour

The eye interprets any colour sensation by its responsive activity to that colour, such response being controlled by three sets of nerve centres, each of which reacts to light waves received through the iris. When the response of these three nerve centres is equal we experience the sensation of white light. It is known that the waves of individual colours represent only a portion of the white light, and further that the simplest division of white light can be demonstrated by three distinct bands, viz. red, yellow and blue. This knowledge simplifies matters for us when we are dealing with visual interpretation of colour.

The fact that our nerve centres react individually to red, blue and green implies that their reaction to composite colours will be in accord with the composition of those colours. Purple, for example, being produced by red and blue, will cause activity in two sets of these nerves—the red and the blue. Green, resulting from a union of yellow and blue, will produce reactions only in the nerve centres affected by yellow and blue.

White light, as already explained, includes *all* the colours of the spectrum, held, so to speak, in solution. And these colours are ultimately divisible into three, red and yellow and blue. It is consequently logical to assume that if we remove any one of the three, the two remaining colours form its “complement”—its opposite number, essential to complete the spectrum. And this is borne out by facts. If red be extracted, yellow and blue remain. Together, they make green. And green is red’s complementary colour, and with it completes the spectrum and makes white. Similarly, by subtracting blue we have red and yellow left, making orange which is blue’s complementary colour.

These physical colour reactions make it necessary for the decorator to place the colours he thinks of using in juxtaposition. Where two are placed side by side, the borders touching each other, the result will be some form of visual disturbance, advantageous so far as the general colour-scheme is concerned, or the reverse.

A fully saturated hue, e.g. a spot of spectrum red, displayed upon a white piece of paper will, if gazed at intently for a short time, cause one to experience what is known as an after-image, occurring when the red spot has been removed and the eye is allowed to rest upon the white paper only. A green spot will appear in the position previously occupied by the red spot. This results from a reaction of the nerve centres which control yellow and blue, and which act as a palliative to the red set.

The latter, owing to concentrated exertion, have become temporarily paralysed, or inoperative, and the nerve centres responsible for the other colour reactions react to the *complement* of the red, which is yellow plus blue, or green. An understanding of such reactions is extremely important when grouping colours in any general scheme.

Plate IV shows examples of the principal forms of harmony in monochromatic colour, sometimes known as self-colouring.

The variations of contrast are produced by a series of varied tints of the one colour only—in this case green.

“*Analogous harmony*” is when the variations are produced by the use of near related colours. “*Complementary harmony*” is that dependent upon the use of contrasts, and it is produced by the use of complementary colours.

Briefly stated, harmony results from the correct proximity of colours, and only by an understanding of the principles involved can any technically sound colour-scheme be evolved. The decorator must be familiar with the normal scale, and with the modifications which it is necessary to observe when planning any scheme. What may be loosely termed a working knowledge of the laws of harmony and contrast forms the very basis of every artist's education.

Contrast

“Contrast” is the partner of harmony; the measure of its quality depending on its relationship in the parent scale. Colours may be divided into those which are similar and those which are divergent or contrasting colours. Between all colours *some* measure of contrast exists, and we must therefore consider to what total changes they may be subjected. This will sometimes be chromatic, independent of actual variation of hue—a simple enough matter if we were able to deal with each one on its state of isolation. Unfortunately, owing to our sensitivity of vision it is impossible to view colour and tone simultaneously without becoming involved in the disturbing influences of contrasting variations. Hence we have to trim our sails to a certain extent in order to preserve harmony and to arrive at what is termed “harmonious relationship.” On the one hand we have the relationship between two closely associated or analogous colours; on the other, contrast between two of greater interval, whether they be divergent or complementary. Harmony may result from gradual or abrupt change; transitional in the first instance contrasting in the second.

Simultaneous contrast

Simultaneous contrast occurs when the vision receives two or more tones of colour simultaneously.

We now have to deal with the problem of colour in relation to its background. Hues are affected, both chromatically and

tonally in juxtaposition, by simultaneous contrast. The more nearly such colours are related, the easier it is to observe this contrast, and the more obviously will they appear to move apart. A good deal of useful information can be obtained by sticking patches of various hues on a coloured background and carefully noting such chromatic or tonal disturbances as occur.

Plate V gives examples of simultaneous contrasts, six essential hues being displayed upon black, grey and white backgrounds. In each case the essential has been taken from the same standardized hue, so that no variation has been possible other than that which has resulted from successive or simultaneous visual inception. The contrasts most evident are those in which an inducted stimulus has been received from the background. Certain individual colours of the lower tonal values (purple is an instance) appear to have gained considerably in luminosity, and an examination of any hue in relation to the varied backgrounds will similarly disclose gains or losses which seem almost incredible. Yellow, for instance, seems quite luminous upon the black, while grey only just makes a successful attempt to hold its own, though upon white it appears to lose part of its saturation.

Most colours gain upon the background, and appear to have a slightly higher key, being brighter, though not quite so pure. Where the background is grey, for example, it will be noticed that yellow and purple have each gained; similarly the effect of black upon green is decidedly conspicuous. But in all cases the saturation appears to be lessened. The background qualities have been impinged upon by the complementary of the colour superimposed.

If each colour be viewed separately by covering up the others it will be noticed that the grey appears warm or cold because of this definite impingement towards the complement of the hue displayed. Still further experiments may be made using tinted papers, which are useful in familiarizing the artist with the affects of colours in juxtaposition.

Colour sense

An appreciation of colour is common to all persons of normal vision, but it is only by actual experiments with pigments that they can learn to use this appreciation effectively.

A small box of water-colours can be used for recording colour notes. The number of pigments required need not be many, but they should be of good quality.

Decoration does not often demand the use of a standard hue of full saturation. Pure colour should be rarely displayed except in minute quantities; masses of colour are more satisfactory when treated in tints, shades or greyed colour. The consideration of the quality and texture of the surface receiving colour is of the utmost importance: in certain circumstances a surface can render invaluable assistance. While, for example, the interplay of light upon a glossy surface would assist in harmonizing a heavily saturated hue, light, delicate colours would prove more satisfactory when displayed upon a matt surface.

Luminosity

Luminosity varies with different colours. It may be used to heighten those parts of a scheme where accentuation would be profitable; while colours less luminous may be disposed where they retard the portions of a scheme which would gain by being subordinated.

The application of colour in the decoration of a room

The preparation of a scheme for this purpose demands a logical attack. Modern housing, with cramped conditions and restricted light and space, has its own special decorative problems, but some measure of beauty can always be achieved.

The surface and texture of materials can often be used to enhance the decorative qualities of paints. The materials I refer to are such innovations as plastics and plywoods, and modern glass. Many of the plywoods are veneered with fine woods, all capable of inspiring schemes of durability and beauty. As wall linings they are admirable, and for many purposes where wood is desirable they can produce beauty, well beyond any effect resulting from imitations produced with paint.

One of the essentials of a room is that it should be light. White creates a delightful background, and used as the supporting colour with well-disposed colour units, can possess a distinctive value. There are, of course, a considerable number of hues commonly classed as "white." On examination of a number of

white articles—paints, papers, fabrics, etc.—we should discover how many subtle variations there are. “Off white” would in point of fact be a far more accurate description of most of these variations.

Plate III, on which are examples of the extension of colours to produce tints, makes it clear that *any* hue may be so extended as to produce a tint that may be described as “off white.”

Before determining a scheme of colour for a room, as we have seen, its aspect must be taken into consideration. A northern aspect will require a warmer tone than that of a room which faces south. The purpose for which the room is to be used also demands consideration. It is always the definite character of a room which gives it its chief interest. The general effect of a dining room, for instance, should be heavier, and its colour warmer than that of the drawing room. Since any house consists of a suite of rooms, such rooms require some kind of link, one conveying consideration of their comparative importance. If pictures are to be the keynote, the walls must fulfil the function of a background and no more. In such cases subdued tones or greyed colours should be used, in order that no disturbance shall occur between these pictures and the background. Where light is the principal consideration, colour and luminosity must conform to this requirement. A suitable scheme in such circumstances would be pale primrose yellow with a slight movement of dove grey, and black frames and the orange hangings. These would give a suitable adjustment. The total effect must be such that it creates relationship, avoids confusion, and preserves balance. It may be rich and splendid, or quiet and dignified, but it should never be monotonously simple.

DESIGN

Design is inseparable from any kind of work which concerns the creative arts. The products of both artist and craftsman should be useful as well as beautiful. A jug should not only pour out properly and look beautiful, but it should look as though it is intended to serve its particular purpose. A carpet in a room should not only be comfortable to tread upon, but should have a satisfying appearance of stability.

Objects must be appropriately designed for their ultimate

purpose, but such design is also subject to limits of material and craftsmanship.

Stone, which is an excellent material for making fireplaces, is quite unsuitable for making furniture. Again, the twists and

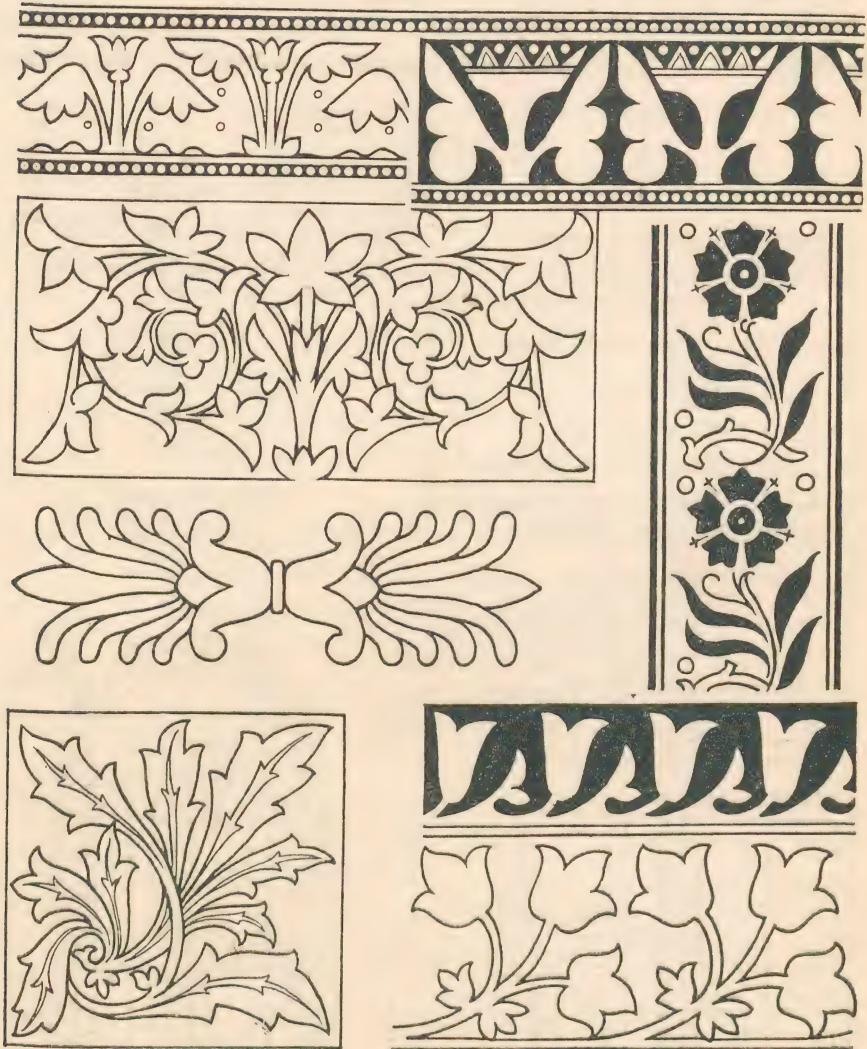


FIG. 1. EXAMPLES OF SYMMETRY AND BALANCE

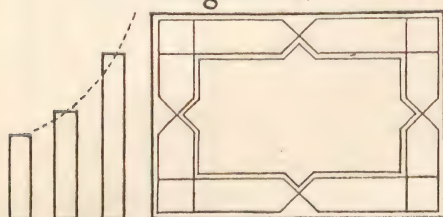
turns which cross the grain of the wood in Chippendale's designs for furniture, though beautiful in appearance, are inappropriate to the spirit of good cabinet-making, since they result in extreme features, while their over-elaboration makes them catch and tear clothes and harbour dust. The work of the generation of cabinet-makers that came after Chippendale shows far better

examples of the principles of fine design. The lines of the work of Sheraton and Hepplewhite are cleaner, their chairs and tables constructed more strongly, and the necessary decoration more sensibly produced by painted ornament and inlays.

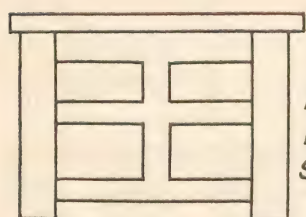
Design in interior decoration, as in all cases, is concerned with rhythm, balance and proportion. Rhythm supplies movement in design, it is the element which averts monotony and deadness.



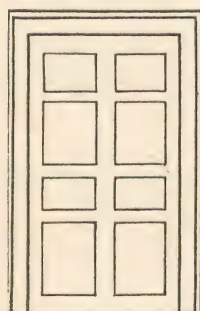
*Square & Double Square
too evident in agreement*



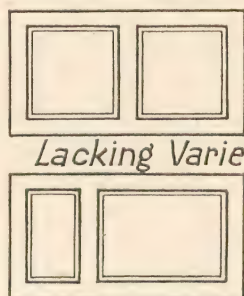
Proportionate Relation



*Lacking
refinement
in relation-
ship of parts*



*Examples of
Proportion, or
Relationship of Parts*



Lacking Variety

*Variety, by
Inequality*



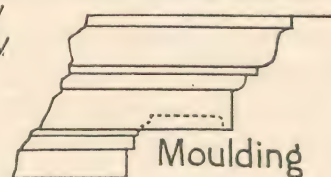
Greek Moulding



*Greek
Hydria*



*Iron
Gates*



Moulding

FIG. 2. THIS EXAMPLE ILLUSTRATES THE VARIETY GAINED BY THE JUDICIOUS PROPORTION OF PARTS

It can be achieved quite simply from the distribution of colour, form, or line, and it forms the connecting link between individual features. In interior decoration it most often results from the repetition of a colour movement by the introduction of cushions, furnishing draperies, and ornaments of the same colour.

Balance is a correspondence between the various parts or units of a scheme. It is usually based upon a central feature supported by elements of equal importance. As an example, one may quote

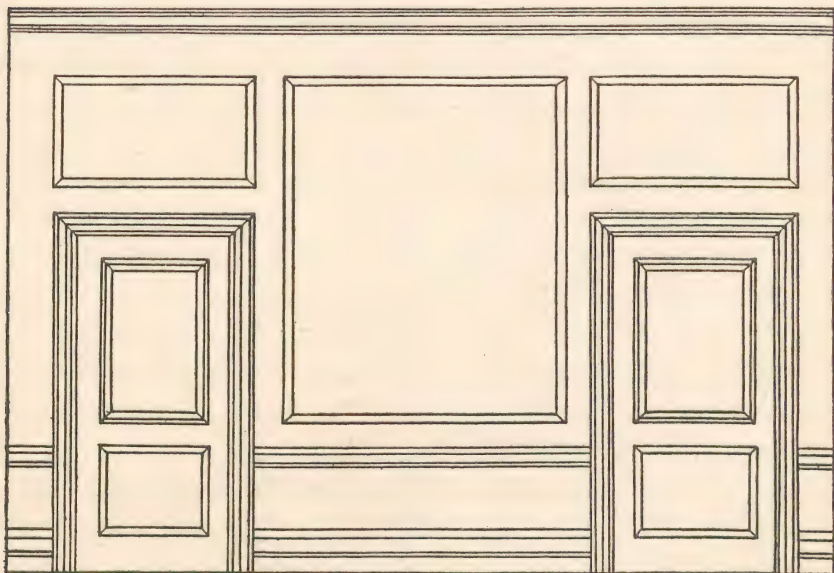


FIG. 3. AN EXAMPLE OF GOOD PROPORTION AND BALANCE

a wall in which two doors balance each other, one on each side of central feature, such as a large book-case.

Proportion, which is closely associated with balance, is more difficult to define, since it is not subject to hard-and-fast rules. One may term it the correct relationship of unequal units. Fine proportion cannot be achieved when the component parts are too many in number, nor can it be obtained when the dominant factors are equalized. The equal distribution of the colours of a scheme will always be uninteresting, and may be actively unpleasant. Equal quantities, except when symetrically disposed, are always confusing, so that although it is possible to say what destroys good proportion, it is not possible to say what makes it. Fortunately, most people have an innate sense of proportion, and realize when they have achieved it.

It may be fairly stated that experiments in interior decoration will be most successful if they are essays in simplicity.

Simplicity in colour is best obtained if the too obviously "arty" colours are avoided. They are too far removed from colours of nature. A reproduction of a first-class painting provides an excellent starting-point for designing a scheme of colour. A whole room can be built round the copy of a work by one of the old masters, or by a modern painter, such as Van Gogh, the proportions in the painting being repeated in the hangings, walls and furniture of the room.

It can be assumed that the greater our knowledge the more ordered and less "emotional" will be our selection of a colour scheme. The more civilized we become, the less we shall favour large surfaces of bright colours. Young children and savages love crude colour in masses.

Old buildings are very distinct in conception from those of our own time: to-day, a house is no longer regarded as a set of separate cells—hall, dining room, drawing room, etc.—but as an integrated whole possessing a flow and continuity through its entire space. This difference is likely to be intensified in the coming years. Walls are no longer immovable, they can be made to fold, slide and disappear, and the prefabricated house heralds the sectional building of the future.

This new treatment of structure involves also a new approach to interior decoration. When considering the redecoration of a room, it should be borne in mind that one room opens into another; the relationship between the two must not be overlooked. A simple example of what should be avoided would be a dining room in pale green adjoining a living room in a pale ultramarine blue. So close an association in the use of the two rooms should be reflected in a close association in colour. The communicating door will emphasize this close relationship.

Before the colour scheme of any room is decided upon, that which is to be used in adjacent rooms must be considered. Harmony in decoration is best obtained by planning the schemes for the entire house at the same time. Where curtains have to be chosen for two or three rooms all facing in one direction, uniformity is required; the colour and material selected for them all must harmonize with each of the other three rooms.

It has been stressed that the requirement most generally

needed for interior decoration is simplicity, a background for restfulness. The colours are going to be seen for prolonged periods, in contrast with public interiors which may be startling and even challenging. The only room in a house which requires to be stimulating is the entrance-hall. Here, because nobody is going to stay very long, one has a chance to introduce the brightest and gayest colour. It is a place of welcome. The recession of the other rooms from the hall can be obtained by the use of paler colours.

Not only should one room link with another, but the particular purpose of each must be served by the colour used. The function of bedrooms, for example, is best expressed by the neutrality in colour; all patterns must be chosen to convey an effect of repose and tranquility. The room in which we live is best decorated in a warm colour. The kitchen, where to-day the housewife spends so much of her time, requires special consideration. Being a particularly functional room, its design requires careful attention. The colour should be very light and bright, and the surface chosen one that is particularly easy to clean. If the kitchen is placed to the north of the house, there should be a compensating glow of yellow in the walls.

It is not only that houses of previous centuries are distinct from our own because of the different conception we have of the use and relation of rooms; clothes and social life have changed too, and in their changes have influenced interior decoration. More than ever, simplicity must be the keynote.

CHAPTER XXV

PAINT

The maintenance of a building implies the preservation of the structure, and involves individual treatment for the surfaces of the fabric. These surfaces are constructed of a variety of materials. Many form the internal skin, whilst others situated externally have to withstand the ravages of weather and climate. The work of maintenance generally performs a dual purpose; it affords security against wear and decay and also involves decoration.

For both these purposes there is nothing more suitable than paint. The materials from which it is made can be adapted to fulfil the requirements of almost any surface and purpose, while its actual application can be undertaken by any person using average care and possessing average intelligence. Before any surface can be decorated it must be properly prepared according to its own particular requirements.

Iron, plaster, wood, stone, etc. have varying degrees of porosity, each requiring different treatment and differing paint mixtures. Successful painting goes far beyond mere brushwork. It demands at least some knowledge of its materials and structure.

When mixing paint, a careful choice of both pigment and vehicle must be made. Some pigments are useful chiefly for their qualities of perservation; some are delicate and beautiful in colour; others, while beautiful, are unable to retain that beauty when subjected to unfavourable conditions. The fluids, vehicles or mediums by which dry pigments are converted into paint-mixtures also possess individual and varying qualities with which the would-be decorator should be familiar. Technique and craftsmanship can be achieved only by study and practical experience.

Tools

Correct choice of tools is obviously important. Among the many items involved are brushes, cutlery, dust sheets, paint

kettles and scaffolding, and while a survey of these must be reserved for a future chapter, it is not too early to remind the reader that whatever tools are purchased only those of good quality are really serviceable and economical in use.

Planning

Planning forms an integral part of painting operations. Preparation of surfaces, filling, priming, and the succession of the various coats of paint should all be carefully organized; by this means only can the necessary experience and confidence be gained.

Such equipment as is required should, if possible, be treated as forming part of a painter's stores; it is always better to possess your own tools rather than to borrow them, and convenient to separate painting tools from other household effects, if only to prevent any arguments with the household.

Certain materials used for the manufacture of paint are of a poisonous nature. In the trade, certain regulations are enforced with regard to their use. These regulations concern precautions which are compulsory when white lead and lead derivatives are used, and the measures that must be taken to ensure the proper cleansing of the skin with soap and water before stopping work for meals. Overalls must be worn when paints constructed from these materials are being used, and be slipped off immediately on leaving the job. The amateur should follow these precautionary measures as far as possible.

Ready mixed paints are easily procured. Manufacturers of established reputation market paints which have been carefully prepared, graded to meet the requirements of every purpose. The actual quality will naturally depend upon the price paid.

The preparation of one's own materials is, however, neither costly nor laborious, and when the paint has been prepared, the knowledge acquired in the process is of very considerable value. Any desired variation or adjustment becomes a simple matter if the constituents are understood.

The composition of paint

There are three essentials necessary for the production of paint; the pigment which supplies the colour and opacity for the

mixture; the binder which carries or binds the tiny particles of the pigment, holding them in proper suspension so that they may be spread over a surface to produce a uniform film of paint, and the thinners which are added to the paint to render it more fluid so that it can be easily spread with a brush or tool. It may be found that a normal mixture of paint containing pigment, thinners and binders may be too slow in drying to render it suitable for its purpose and that it is required to be speeded up in this respect. When this is so, patent driers are added to overcome the difficulty.

The materials must be varied when making the paint so as to produce mixtures suitable for specific purposes and materials. Surfaces and materials are subjected to different conditions and these factors will need considering when paint has to be made for a particular purpose. Paint for external work will be different from that which is suitable for internal decoration, and iron, wood, or plaster surfaces need a careful selection of pigment and medium to ensure satisfactory treatment.

The qualities of pigments vary considerably. Certain pigments are artificial, others natural. Some are hard and brittle, others are soft and spongy. To fit them for the painters use they mostly require to be broken by grinding into very tiny particles so that they may be distributed as a fluid or paint. They are not workable as a powder, and are therefore incorporated with a medium, or binder. The binder may be water, spirit or oil, selected according to the type of paint required.

To make oil paint, the medium in most general use is linseed oil. When a pigment is described as being ground in oil, it implies that the pigment and oil have been mixed and ground together until reduced to a smooth stiff paste. The amount of oil varies according to the pigment. Some require about 9 per cent. oil, others may contain up to roughly 25 per cent. Some pigments are known to be permanent in colour content, others are not so constant, and some are subject to deterioration when mixed, owing to chemical interaction.

Linseed oil is manufactured in three grades. Pigments ground in oil do not contain a sufficient amount of lubricant and linseed oil must be added. This will dry by contact with the oxygen in the air.

To obtain a satisfactory dry paint film, the oil which is carrying the pigment must be evenly spread, otherwise the drying will not be even, according to the amount of oxidation that has resulted. Furthermore, if there is an unequal elasticity of the surface, due to the unequal distribution of paint, the weaker portions will crack. Cracking will also occur if successive coats of paint are applied before the previous coat has dried, as each fresh film of paint will shut off the supply of oxygen required to dry the under coat.

The adjustment of the oil content is most important. Alternate coats of paint should be similar in composition, though fluidity of the vehicle may vary. The first coat is usually a priming coat, and should contain three parts turpentine and one part of oil. The third coat should also contain three parts of turpentine and one of oil, while the second should have three parts of oil and one of turpentine. Two coats of paint, each containing a predominance of oil, should not be applied in succession, nor should two sharp coats in which turpentine dominates be applied in succession. The variation results in better cohesion in the paint films and prevents cracking on the surface. By systematically varying the medium, the thinners, and the oil, the quality of the final surface can be assured. The elasticity of the surface is of primary importance. The oil-film formed must not be hard and brittle, and varnishes, or enamel paint with a varnish medium, should never be applied over an oil coat, but should be applied over a flatted coat, which relies upon turpentine for its fluidity.

Flat enamels are an exception, and they can be applied over a flatted surface. The oily nature of paint demands that any surface upon which it is to be applied shall be free from moisture, otherwise improper adhesion of the paint film will cause blistering.

Paint applied without a sufficient binding medium dries with a powdering surface, capable of being dusted off when dry.

To summarize, the oil which carries the pigment gives a protective film by oxidation of the oil, and within the film the pigment, if properly ground, will be evenly distributed and sealed as a surface. The thinners not only liquify the mixture but assist the drying. By the addition of thinners, the oil film is distributed over a greater area, exposing it to a wider range of atmosphere and speeding up oxidation. The thinners dry by

evaporation and absorption; a double process for which atmosphere is again responsible. When driers are used, they may be in the form of patent paste driers or liquid oil driers, they should always be of a reliable brand and never used in excess. The selection of oils requires great care. Refined linseed oil, having less staining power, is necessary when dealing with delicate tints, whites, etc.

Properties of materials

A work of this character does not justify an exhaustive treatise on the properties of the various materials used in the manufacture of paint, but must be limited to a statement concerning the broad facts of their structure and behaviour. All these materials have already received attention in the laboratories of the chemists, and through them have become the property of the trade; users, in turn, have benefited from these results.

Pigments

Pigments supply the content of colour, and in the finest materials they represent that intensity of saturation equivalent to the normal scale of the spectrum. Unfortunately, no rigid standardization of colour exists, therefore variations of intensity will be found between the pigments of various manufacturers. The permanency or the reverse of pigments is of importance, though in most cases the structure of the paint will sufficiently overcome any difficulties which may arise.

The "hiding power" or opacity of a pigment gives body to the paint and represents its power of obliteration. White lead is extremely dense. Zinc oxide would require three coats of paint to equal the opacity of two coats of white lead. Staining is a quality which varies in different pigments. The quality of an individual pigment in this respect can be measured by the use of a white base. By adding one drip at a time the staining quality can be appreciated.

Grinding is of great importance; all pigments should be prepared in as fine a state as possible. Modern machinery is used in both the mixing and grinding, and a good quality pigment can always be relied upon. The grinding of the pigment has to be done with the aid of a medium which may be oil, spirit, gold size, or water. The medium and spirit is placed in the mixing

mill and after they have been mixed are transferred to the grinder. When the grinding has been completed, the mixture emerges as a stiff paste, and this by the further addition of that is termed the "vehicle"—oil, turpentine (or both), or any other suitable liquid, becomes paint ready for use.

In the preparation of enamels the vehicle consists of varnish.

The oils generally used are forms of linseed oil, and may be the raw oil, refined linseed oil or boiled linseed oil. The thinners are invariably turpentine, white spirit, or turps substitute.

Materials

White lead is one of the oldest, and also one of the most generally favoured, of white pigments and there are several processes by which it is manufactured. The finest quality is produced by the Dutch Stack process. The pigment, being a derivative of lead, is produced from the white incrustation (carbonate and lead hydrate) formed when the lead is treated by fumes and is made with a mixture of spent Tanner's bark.

Zinc oxide is a more recently established pigment, and is now extensively used in the manufacture of paints. In its production zinc ore is volatilized and converted into zinc oxide. When manufactured in this way it is fairly pure, and careful supervision during the process of production practically eliminates all foreign matter. It is marketed as about a 99 per cent. pure oxide. When ground in oil it absorbs about 14 per cent. of oil compared with approximately 9 per cent. in the case of white lead, but both its covering power and opacity are less.

The film produced by zinc oxide paint is more brittle than that of lead, and the addition of driers needs careful consideration, too great a quantity being likely to cause cracking. The pigment is a very serviceable hard-wearing one, and will produce an excellent finishing coat. It is not susceptible to atmospheric action. When procuring it, stipulate that you require zinc oxide, since zinc white is usually a debased form of the pigment.

Titanium white

This pigment is also a recent addition and it is of a fine pure white tone and has many qualities to recommend it for use in paints. It is not affected by sulphur fumes, heat or acids. Titanium dioxide is produced from titanium ores; it is absolutely

non-poisonous; it has extreme permanency of tone, and is of great density, but it has a tendency to chalk, which can be corrected by the addition of 25 per cent. of zinc oxide which hardens the film. The pigment absorbs about 25 per cent. of oil when it is ground, and it has extremely good hiding power and can be mixed with other pigments freely.

Lithopone

Lithopone is a sulphide of zinc which is a very useful white pigment of good colour, body and density. It is non-poisonous and is used chiefly in the production of undercoatings and fillers. It possesses excellent qualities useful for a very wide range of purposes.

Natural white pigments

There are a number of natural white pigments, and they are invariably classified as inert pigments possessing little, if any, chemical action in contact with the ordinary materials from which paints are produced. Most of these are legitimately used as bases for the production of light tints, or as "extenders" for the purpose of extending other pigments of an expensive character to bring them within a reasonable price.

Red oxide

This pigment is extremely durable, and excellent for preserving iron and steel from rust and corrosion. It is used for that purpose where these metals are exposed.

Red lead is produced from lead by oxidation. As it is poisonous, those using it are subject to the same regulations as other lead products. It should never be used in a dry state. In combination with white lead it has considerable use for wood primings. It is subject to atmospheric variations.

Vermilion

Vermilion is a mercuric sulphide. It is the heaviest pigment known, and when ground is very difficult to keep in suspension. This colour, a brilliant scarlet, possesses great opacity. Owing to its high price a substitute known as Vermilionette has been produced. Although not so permanent as vermilion it forms a valuable alternative.

Yellow pigments

These synthetic colours are the product of both natural elements and manufactured pigments. The first-named derive their colour from oxide of iron, the variations of shade being controlled by chemical composition.

Yellow ochre

Yellow ochre is probably the most extensively used of the yellow pigments. It is permanent, inexpensive, and very easily ground in oil, but not extremely opaque. It is frequently desirable to tone it up with chrome. It forms an excellent ground for graining, and is also extensively used in the preparation of buff tints.

Chrome yellow

Chrome yellow is a very heavy pigment, supplied in a range of colour from primrose to pale orange. It possesses good opacity and excellent staining power, but in common with other lead pigments is subject to atmospheric gases. It should not be mixed with ultramarine or lithopone. The three varieties of this pigment are known as pale chrome, middle chrome and chrome yellow. Fine chrome is a substitute for chrome yellow, and is obtained from zinc oxide, a pigment of bright yellow colour which does not possess the same opacity and covering power, but which possesses certain other advantages. It is more permanent, and it is not affected adversely by the atmosphere.

Cadmium yellow

Cadmium yellow is a cadmium sulphide, a brilliant yellow pigment. It is not extensively used, owing to the cost of production, but is far superior to the chromes, either the lead or zinc oxides of chrome.

Prussian blue

Prussian blue is a very widely used pigment, is produced from potassium ferro-cyanide and ferric or ferrous salts. It may be described as a green blue. Its hiding power is rather poor, and it also has a tendency to transparency; it is readily affected by

alkali, and if used upon plaster work deteriorates quickly, the blue changing to a dirty brown.

Ultramarine blue

The original pigment, which was produced from Lapis Lazuli, would be far too expensive for commercial paint manufacture, but since the process discovered in 1828 has been developed and improved, the pigment has been produced in large quantities at a reasonable price, and its use has become universal. The commercial product ultramarine, which is a pigment slightly on the purple side of blue, possesses a sulphur content and should not be mixed with other pigments containing lead, copper or zinc. It is impervious to alkali and can be used freely in paints or distempers, but as ultramarine lacks density it is rather transparent especially when ground in oil.

Lime blue

This pigment, specially prepared for use in distemper, is for surfaces containing lime. It is not suitable for oil paints.

Cobalt blue

Cobalt blue is a pigment of sky-blue colour. It is very expensive to produce and is little used by the decorator.

Black pigments

Black pigments are mostly derived by burning organic matter, and are carbon deposits, bone black and ivory black are examples. In these, the carbon content is low, and the colour only fair in consequence. Lamp black is used to produce paint and enamels and is very difficult to handle.

Vegetable black

Vegetable black is the pigment from which the finest black is produced, and it is composed of pure carbon. It has a bluish tone when compared with lamp black, and possesses excellent staining quality. It is not affected by alkali, and it remains permanent when exposed to light.

Carbon black

Carbon black is a product which is mostly imported from America. An excellent pigment, it is also probably the darkest black procurable.

Brown pigments

Brown pigments are principally natural products. Raw umber has a base of iron oxide similar to ochre; in colour it is a greenish yellow and when ground it possesses a smooth texture. Raw umber is quite permanent and mixes freely with other pigments.

Burnt umber

Burnt umber is a pigment which, as the name implies, is produced by roasting the raw umber, which changes it to a rich red colour. It is a thoroughly reliable pigment.

Raw sienna

Raw sienna is a yellow pigment of the same nature as the umbers and possessing the same valuable qualities.

Burnt sienna

Burnt sienna is obtained from burning raw sienna. The colour is a richer tone—a deep red.

Green pigments

These pigments are almost entirely produced by chemical process. Terra-verte is the only natural green pigment which is considerably used by the decorator. Dull grey green in colour, it is quite permanent, though rather transparent when ground in oil. It has considerable use in the preparation of distempers.

Brunswick green

This is the most important green pigment. It is a combination of Prussian blue and chrome, and is produced in a number of shades. The most luminous is an extremely bright colour, and the lowest shade is almost black.

Brunswick green possesses excellent covering power and durability when of a good quality; otherwise it needs the protection afforded by a coat of varnish. It mixes well in oil and supplies a series of durable paints. Although used for distemper as water paints, this pigment is subject to deterioration when in contact with alkalis.

Emerald green tint, bronze green, zinc greens

All of these greens are useful pigments, the first two being a modification of Brunswick green, and the last a much more permanent pigment, providing a larger range of colours.

Paint mediums

As already stated, the pigment ground by the manufacturer is delivered as a stiff paste, and the medium or "vehicle" used may be oil, water, or spirit. Oils may be divided into three kinds: non-drying oils, semi-drying oils, and drying oils. The non-drying oils have uses, but such uses involve incorporation during the processes of manufacture. The most important oil required in paint mixing is linseed oil, which when exposed to the atmosphere oxidizes and is converted into a solid film. The process of drying usually requires about 30 hours.

Raw linseed oil

The crude oil is extracted from the seed of the flax plant and when it comes from the press it contains impurities, which settle as a sediment. In this condition it is known as raw linseed oil. For general purposes it is quite suitable, though somewhat cloudy in appearance, with a distinct yellow green colour. Linseed is also manufactured in two other forms, one being refined linseed oil, which, as the name implies, has been washed and freed from all impurities. During the process of refining the oil loses much of its colour, being bleached by exposure to sunlight for several months, and becoming pale yellow in colour. When light pigments are to be ground, or delicate tints of colour have to be made, refined oil is to be preferred.

Boiled linseed oil

Boiled linseed oil is produced from the raw oil. The oil when processed loses much of its colour, becoming a pale straw colour. It is not so serviceable as raw linseed oil, and if used in excess has a tendency to blister. It is used to grind light coloured pigments and in paint mixtures which have no lead content.

Solvents or thinners

Thinners form an essential constituent for producing the vehicle of a paint mixture. Their use renders the paint more

fluid, and properly proportioned will control the degree of gloss the paint will possess when dry. Linseed oil alone would not make a satisfactory vehicle for paint. It is by using correct proportions of thinners and oil that the proper balance of the medium is achieved and variations of paint mixtures prepared. The action of the thinners also assists the drying of the paint, since by allowing the paint to be spread over a greater area it results in a more rapid oxidation of the oil.

Both turpentine and turps substitute are excellent as thinners. Turpentine has always been the most commonly used for the purpose, as it is completely volatile. It dries by evaporation and absorption. Turpentine is a resinous substance which flows from certain trees—pine, larch and fir are examples—known as “turpentine trees.” This resin is distilled to produce the spirit. Turps substitute is a petroleum product produced by distillation. For use with paint it must be of good quality.

Driers

A paint constructed normally from pigment oil and thinners does not always dry with sufficient speed to allow satisfactory progress of the work. Adjustment of the oil and turpentine can be made. But this adjustment is limited, for beyond a certain point the structure of the paint would be impaired, and deterioration and lack of permanence would result. To accelerate the drying of the paint, and also to retain the correct balance of its structure, it is necessary to introduce materials which will cause the oil to oxidize more rapidly. For this purpose dryers are added, the materials used for this purpose being chiefly compounds of lead or manganese. Those which have the most general use are patent paste driers, liquid oil driers, and terebene. Patent paste driers are manufactured as a stiff paste and are ground in oil. They consist of a drying agent such as white lead, manganese, or lead acetate, with barytes or similar material ground in oil as a reducing agent. Only those makes which are produced by a reputable firm should be used.

Liquid oil driers and terebene

Liquid oil driers are preparations in which drying mediums have been mixed with oil adulterated by the addition of a small percentage of spirit, and of resinous matter. The greatest

volume of the mixture is composed of the oil, and this gives more latitude in its use. A little extra oil added to the paint film gives elasticity to it, and makes it more uniform in action, whereas an excess of patent driers will be likely to cause cracking of the surface.

With terebene, the drying agent has been chiefly reduced with spirit plus a small percentage of oil and resinous matter. It has a tendency to settle when it stands for some time. If this is allowed to happen the drying matter solidifies and sets solid. In which case the mixture will not be complete, and if used would add mostly spirit to the paint instead of driers. An excess of terebene will cause the paint to crack.

Gold size

This material is processed by boiling gum, red lead, litharge, copperas and oil. Its principal use is as a drier in the production of flat oil paints. It should not be used in excess or cracking will ensue.

Stainers

The section dealing with the theory of colour should be consulted when definite shades or tints are required. The principles there stated are of great practical value.

Tints cards are of little practical use, being usually a mere catalogue of some particular merchant's wares. When the responsibility for planning the colour-scheme of any important building arises, those concerned subject the various colours chosen to visual tests. Parts of the structure are painted to display a certain portion of the selected colour, so that it may be viewed in association with actual lighting and conditions.

Here are a few suggestions.

Let us assume that green, a combination of blue and yellow, is required. The blue will be either on the green side of the scale (similar to Prussian blue) or it will be taken from the red side, in which case it will be ultramarine. If the yellow chosen is a lemon chrome, it will be on the green side: if deep chrome or yellow ochre, on the red. Red is the complementary colour to green, and if mixed with a green pigment will produce grey. It is used for the purpose of greying or neutralizing a harsh green. You will therefore make your choice of pigments for the mixture to produce the type of green required for a grey-green, that is ultramarine and ochre or deep chrome. If a good

spring green is required, use pale chrome and Prussian blue, adding afterwards such neutralizing factors as may be required.

A strongly saturated green may be easily reduced in tint by the addition of white. It is often necessary to produce a quantity of colour, to give a certain tint, such as cream, pink, grey, stone, biscuit, ivory, almond or green. These can be produced by using a white base and making the colour by using stainers. Most dark colours in their production need a dark base, such as black, brown, blue or green, according to one's particular requirements.

Stainers, to which reference has already been made, supply the colour content for mixed paints, and also when necessary for the correction of such paints. When required for oil paints, those ground in oil must be used. Manufacturers usually market them in sealed tins of 1 lb. and upwards. Small quantities, suitable for many experimental purposes, are supplied as decorators' oil colours, and marketed in 8-ounce or smaller sized tubes. A selection of these types chosen to give a fair range of colour will allow experiments to be made when individual colours are needed, and help the experimenter to avoid waste. Such a selection might consist of French ultramarine blue, Prussian blue, yellow ochre, middle chrome, venetian red, vermilion, alizarine crimson, lamp-black and viridian. A small palette knife and a sheet of glass are also required to mix the colours on. The white pigment when required can be taken from any mixed or semi-mixed paint, or a tube of zinc white may be used. A series of colours showing the result of mixing various pigments is given at the end of this chapter. Only very small quantities need be used, but careful notes should be kept of these quantities. These will prove of considerable help when you are making the actual paint you require.

When using stainers, break them up well before mixing with your bulk colour. They should be very carefully incorporated. Strain beforehand to ensure the mixture has been properly made. Make sure that no small pieces of the staining pigment remain in the unmixed paint.

Producing colours

Greys may be produced by mixing black and white until the required tone results. These greys may be adjusted by the use

of small quantities of yellow and lake (crimson) and sometimes by a little cobalt or ultramarine blue. If they are used with skill they provide a range extending from dove grey to a pink pearl grey tint. The variations possible extend from off white to a fully saturated grey. Beige in its many forms can be produced from the above, in which case the black must be carefully controlled, and the qualities of colour produced from the livelier pigments.

Greens

Almond green: from white and middle Brunswick green.

Apple green: from white, Prussian blue and lemon chrome.

Bronze green: from deep chrome and black.

Bronze green (tint): from white, deep chrome, yellow and black.

Eau-de-Nil: from white, Prussian blue and chrome yellow.

Duck egg green: from white, Prussian blue, chrome yellow and vermilion.

Emerald: from white, vermilion and lemon chrome.

Grass green: from chrome green and yellow chrome.

Slate green: from ultramarine blue and yellow ochre.

Ivy green: from yellow ochre, Prussian blue and black.

Nile green: from white, viridian and Prussian blue.

Olive green: from chrome yellow, ultramarine and Indian red.

Sage green: from white, black and yellow chrome.

Yellow

Apricot: from white, chrome yellow and alizarine scarlet.

Buttercup: from white and chrome yellow.

Cinnamon: from white, burnt sienna and yellow ochre.

Champagne: from white, chrome yellow and burnt sienna.

Citrine: from chrome yellow and raw umber.

Coffee: from burnt umber, yellow ochre and burnt sienna.

Daffodil: from white, chrome yellow and venetian red.

Fawn: from white, raw sienna and raw umber.

Gold: from white, chrome yellow and burnt sienna.

Golden yellow: from chrome yellow and yellow ochre.

Old gold: from middle chrome, vermilion and brown lake.

Sandstone yellow: from white and yellow ochre.

Straw: from white, lemon chrome and raw umber.

Blue

- Azure blue: from zinc white and ultramarine blue.
- Celestial blue: from Prussian blue, viridian and white.
- China blue: from Prussian blue, raw sienna and white.
- Metallic blue: from cobalt blue and viridian.
- Neutral blue: from white, Prussian blue and burnt umber.
- Navy blue: from Prussian blue and black.
- Royal blue: from Prussian blue, crimson lake and white.

Red

- Salmon pink: from white, yellow ochre and vermilion.
- Terracotta: from white and venetian red.
- Tuscan red: from Indian red and rose pink.
- Rose: from white and crimson lake.
- Pink: from white and alizarine scarlet.
- Plum: from Indian red and ultramarine blue.
- Blood red: from vermilion and black.

Brown

- Brown: from burnt umber and chrome yellow.
- Buff: from white and yellow ochre.
- Brown: from Indian red and black.
- Chocolate: from burnt sienna, crimson lake and black.
- Drab: from white, burnt umber and yellow ochre.
- Russet brown: from Indian red, yellow ochre, burnt umber and black.
- Leather brown: from white, yellow ochre and Indian red.

Purple and mauve

- Heliotrope: from white, ultramarine and venetian red.
- Mauve: from zinc white, cobalt blue and crimson.
- Lilac: from ultramarine blue, crimson lake and zinc white.
- Cream: from white, mid chrome and vermilion.
- Ivory: from white, yellow chrome and crimson lake.
- Stone: from white and yellow ochre.

The results, when mixing the colours which are given, will be helped if you can visualize the colour required. Your experiment should be carried out in the same way as an artist produces the colour he requires, which is by taking very minute quantities, preferably with a small hog hair brush, and mixing them on a

palette or piece of glass. It will be found that with a mixture such as cream, white will be the dominant and a very tiny quantity of middle chrome and the slightest suspicion of vermillion will be all that is required in addition. By making the various additions in minute quantities you can prepare your sample strip, then being aware of the staining power of the various pigments the bulked mixture can be easily prepared.

Varnish

Few surfaces can compare in finish with those which have been properly prepared, finished flat and then varnished.

It is essential, however, that each coat of paint shall be properly built up, and then carefully prepared by rubbing down, a double process which must be continued until the surface has been rendered suitable for the varnish to be applied. Gloss paints are a comparatively recent innovation. They are very popular, and also durable, but for quality of surface and finish they are not equal to those which are varnished. Before their use, craftsmen built up such surfaces by unlimited coats of paint. These were rubbed down with pumice powder and water, and then by the skilful application of varnish a finish obtained which gave joy to the eye and delight to the craftsman. We are now living in an age where time and speed are of the utmost importance, but a job carried out with the thorough-going care and patience of the past is still worth while. It may be added that, when properly selected, English varnishes may be compared to advantage with those of any country. Their fine quality is the result of two centuries' experience by our manufacturers.

Sufficient varnish only should be applied to allow it to flow evenly. Extreme cleanliness must be observed; grit, dirt, or grease are fatal in the use of varnish.

Varnish-making is a highly specialized industry. Industrial chemists in recent years have done much to standardize the various types of varnish produced, and they have also produced substitutes for many of the rare gums used in the manufacture of varnish.

Oil varnishes

These are produced from a selection of hard and soft gums, which are run (melted) to reduce them to a fluid consistency. To

bring them to this condition they are subjected to extreme heat; when sufficiently fluid, linseed oil, which has also been subjected to a similiar heating process at about 350 degrees is blended with it. The mixture is then subjected to further cooking until it becomes a clear transparent fluid, free from any cloudy effect. When this is partly cooled, it is thinned down by the addition of turpentine until it reaches the required viscosity. In this state and while it is still warm, it is transferred by pumps to the filter tanks, passing through framed filter cloths designed to remove mucilage and other impurities. Fine varnishes are then stored for many months during which time they mature and generally improve their drying qualities. The manufacture of any fine varnish must be attended with the greatest skill and care.

Samples of every batch produced are submitted to the laboratory, and each is tested and examined. No varnish reaches the market that has not been subjected to the most critical analysis. A varnish produced by a reputable manufacturer can be confidently accepted and it will perform all the functions of a fine varnish.

Spirit varnishes

These are not used to any great extent in decoration. They are produced mainly from shellac and other resinous gums; methylated spirit and turpentine form the solvent.

Varnish manufacturers can supply varnishes required for any specific purpose, and their trade list will furnish all the information the buyer needs. Broadly speaking, all varnishes fall into two types—those suitable for external use, and those that are suitable for internal purposes.

Gloss paints and enamels

These are both durable and serviceable, and when quick drying paints are required, hard gloss will be found to fulfil the required conditions. They have the appearance of a varnished surface, and in reality they are varnish paints. The medium with which they are constructed is a form of varnish, and consists of congo gum, wood oil and a small addition of linseed oil to provide the paint film with the necessary elasticity to prevent it cracking. As gloss paints and enamels are prepared for both external and internal use, care should be taken to ensure that

your selection will suit the purpose for which it is required. The prices charged vary considerably, but the safest guarantee of quality is a reasonable cost substantiated by the name of a good manufacturer.

Enamels have a reputation for long and reliable service, and though of recent times they have lost much of their popularity, chiefly because of their slow drying, those of the first quality are still obtainable. The high cost of production also puts them at a disadvantage where economy must be considered. The production of enamel has much in common with that of varnish paints. The pigment is ground in linseed oil. The preparation of the oil requires considerable heat to render it suitable for incorporation. When grinding the pigment a slight addition of turpentine is required to keep it workable. The time required for enamel to dry after application is from 36 to 48 hours. Skill is required to apply it correctly, and unless brushed out correctly the film will be unsatisfactory when finished.

Flat enamels

These are prepared in a medium of specially made oil varnish which contains a particular matting agent. This agent consists of a wax substance suspended in the varnish. If it has been finely prepared and thoroughly incorporated it spreads itself in the drying film and produces a flat velvety sheen to the surface. Flat enamels are made to be applied over plaster surfaces, and for this purpose selected pigments only (those that will not be affected by alkali content) are used. Finishes produced by their use are really fine, having good texture, solidity and richness.

CHAPTER XXVI

PAINTING

Before applying paint to any surface for the purpose of decoration or preservation, it is necessary to understand the technique of the craft, and this technique in turn requires a proper understanding of the various tools concerned. A trained observer could form a fairly accurate estimate of the efficiency of a painter by an inspection of his tool kit.

It is also important to possess considerable knowledge of the materials it is intended to use in the execution of the work. Each successive coat of paint co-operates with the preceding coat, a result that can only be achieved by the proper choice of each vehicle with which the paint is compounded. (By buying a semi-mixed paint it is possible to use it as a base which can be altered by the addition of the vehicle required for any particular purpose.) Successive coats of paint are built up so that the complete work provides one unified solid film.

Procedure of painting

Experience has taught the craftsman that in painting a wall the most convenient sequence is to start at the top left-hand corner, and to continue on the lower section so that its progress is one stage behind that of the upper portions. Where two people are doing the work, the upper part will be "laid off" from the top to the lower section and the lower part "laid off" into the paint of the upper section already completed. The junction of the different sections must be concealed.

Ceilings

For painting a ceiling trestles and boards are required, and they must be placed so that a comfortable reach is obtained. For this work operations will proceed away from the light, and the paint laid off parallel to the wall from which the light is admitted to the room. The surface must be solid when completed, and

New wood

New wood should be primed early; if possible, before leaving the joiner's workshop. The best mixture consists of paste white lead with sufficient red lead to colour the mixture a decided pink. The vehicle for use with this mixture is made from three parts of linseed oil and one part of turpentine. To this is added a small quantity of paste driers, which will be varied according to the conditions prevailing at the time of its use. No particular mention has been made of stopping, filling and rubbing down. The preparation of surfaces is necessary whenever successful painting is required. Surfaces may be finished so that they are glossy, flat (matt), or varnished. The choice of finish dictates the sequence of coats of paint and also the choice of vehicle to be used for each individual coat.

Gloss finishes

These are produced by gloss oil paint, gloss enamel, or by a varnish finish, and for each of these finishes the preparation of the ground should be extremely thorough. Gloss will greatly exaggerate any defects in a surface and therefore careful preparation is required and a liberal number of coats which should be rubbed down after each painting. In each case the gloss finish must be obtained over a flat undercoat in which the vehicle will be mostly turpentine. Varnish is merely a gloss finish to the flat coat, and usually consists of the application of two coats of varnish when the flat ground is dry.

Flat or "matt" finishes

These will require the following sequence of paint mixtures, and the variation of the vehicle to be used should be carefully noted.

First coat, pigment with equal proportions of oil and turpentine.

Second coat, pigment with three parts of turpentine and one part of oil.

Third coat, pigment with three parts of oil and one part of turpentine.

Final coat, pigment with the vehicle to consist of turpentine only. The final coat should be stippled when applied to the surface.

The general principle regarding the sequence for finishing coats is, for a hard gloss the application over a flat paint, and for a flat finish the application should be made over a coat in which the vehicle contains a dominance of oil.

The application of paint

The professional craftsman selects his tools for different purposes. He generally favours the pound brush and sash tools and he also prefers brushes which have already been broken in, because these are more responsive, carry a more suitable quantity of paint and are more adaptable for spreading on paint. Flat brushes are more readily manipulated by the inexperienced painter. The brush being charged with paint should be held firmly and presented square to the wall. The direction of the stroke should be made up and down, and each stroke a slight distance from the preceding stroke. This is continued until a fair stretch has been covered. A convenient stretch will be about 2 feet, and then these vertical strokes are crossed horizontally without recharging the brush. The paint to be evenly distributed must be brushed out. When this has been done the vertical strokes should be repeated. These should be crossed a second time, but this time the action and pressure should be light and care taken to overlap each stroke over the previous one. Finally lay the paint off by a series of strokes commenced at the top and worked downwards. This should be done lightly with only the weight of the brush providing the pressure required. These five operations will give a solid surface of paint.

It has been made clear that to paint a surface requires a sequence of coats, and the chief technical difficulty which presents itself will be the arrangement of the vehicle to render it suitable for the individual purpose of each coat. The application of the coat preceding the finishing coat must possess the vehicle suitable for the finishing coat. The first coat will be the priming coat, capable of penetrating the surface, and possessing sufficient grip of the material to secure adhesion for the various coats which follow. Each coat will require sufficient time to properly dry, otherwise the next coat will seal it in so that it cannot harden properly. The unequal elasticity of two surfaces will cause the second coat to crack. Paint must not be too thick to spread easily. It must be sufficiently thinned and must be

spread so that it can dry easily, if cracking and blistering are to be avoided. Most faults which occur when paint is applied are from badly prepared surfaces, or from poorly constructed paint mixtures. Materials may occasionally be at fault, but a good craftsman can avoid many of the pitfalls by attention to these rules.

PREPARATION OF SURFACES

Ironwork

A coat of paint should be applied to ironwork directly it is fixed, unless it has already received a coat at the foundry. This is particularly important because it is difficult to keep it free from moisture. New ironwork is liable to be covered with mill scale, and wire brushes and scrapers should be used to clear the metal thoroughly of this, otherwise the paint will not secure proper contact. On ironwork the paint should be fairly fluid. A paint film built of three thin coats will be more effective than one thick coat. It must be applied immediately after the metal has been cleaned, so that no opportunity is given for rust to re-form, and the successive coats should each be applied before the previous coat has become hard. Pigments suitable for the protective covering of this metal are white lead, red lead, zinc oxide. Iron oxides, graphite, aluminium and carbon black; bituminous paints are also suitable. Red lead, if used alone, should be limited to the first coat, but it may be incorporated with the pigments in succeeding coats. Chromate of lead may also be used. As a vehicle, linseed and turpentine should be used for paints mixed from lead. A suitable priming coat can be mixed by using white lead three parts, red lead two parts, linseed oil three parts and turpentine one part. This will make suitable priming for wrought or cast iron, which is to be finished in dark colours.

Repainting ironwork

This requires the same preparation. The metal should be free from rust, and any bare portion should be touched up with two coats of red lead before a thin priming coat is put on.

Hot water pipes and radiators

These, after being cleansed of grease and dirt, can be painted with oil paint mixtures, but they may be more suitably painted

if the vehicle used in making the paint consists of turpentine and gold size in equal proportions. If they are to be finished flat, the gold size will need to be reduced gradually in the successive coats. If they are to be finished glossy the paint will be made with japanner's varnish and a little turpentine. Aluminium or bronze are also suitable for this purpose, and if they are not purchased ready mixed they should be bound with japanner's gold size and turpentine. Aluminium is noted for its resistance to oxidization but it is very susceptible to "lyes" which is the strong caustic alkaline solution which attacks the metal. Before paint is applied the surface should be rubbed down with turpentine and medium glass-paper, wiped dry, and then primed with a mixture consisting of copal varnish two parts and turpentine one part, and ordinary paint mixture can then be used.

Galvanized iron

This metal has a natural greasy surface, and before any paint is applied it must be scoured with a mixture of medium strength soda water and carefully rinsed. Afterwards any oil or varnish paint can be applied.

Zinc

Before painting zinc the surface should be roughed with a medium grade glass-paper, or scoured with a solution of soda water. The first method gives better adhesion to the paint.

New plaster

This must be allowed sufficient time to dry and neutralize before it is painted. The surface should be rubbed down to remove any irregularities of the surface. All cracks and holes should be repaired by using Keen's cement, or a distemper filler consisting of a good brand of water paint stiffened with the addition of plaster of Paris. All fillings should be rubbed down to make the surface perfectly smooth. If a distemper filling has been used these fillings should be touched in with a glaze before the priming coat is applied. The first coats should be thin and penetrative and the vehicle made of equal proportions of linseed oil and turpentine. The pigment used can be white lead plus a small quantity of red lead, unless the colour content of the red

lead would be apt to interfere with the finishing colour. The surface should be lightly rubbed down with water and abrasive paper when it is dry.

For the second coat a variation of the vehicle is required. This should be linseed oil three parts and turpentine one part, and the paint should be well laid in with the brush. It will require two days to dry.

The third coat is the preliminary to a finishing coat of gloss paint, and, in addition to the pigment it should be tinted with a little of the finishing colour. The vehicle should consist of three parts turpentine and one part of linseed oil. The pigment used could be titanium white if the finishing colour is to be light. When properly dry, it should be lightly rubbed down before applying the finishing coat.

Finishing coat. Full gloss

In the final coat, use titanium white plus 25 per cent. of zinc oxide, and a vehicle made from three parts of linseed oil and one part of turpentine, tinted to match the colour required. When large expanses of wall are to be covered, plan the sequence of operations carefully. A sufficient amount of colour should be used in the third coat to prevent difficulty of covering when applying the finishing coat.

Repainting a plaster surface (two coats)

Here again the surface must be sound before repainting. A blow lamp cannot be used upon a plaster surface, consequently any blisters or damaged paint must be removed by the use of solvents. Wash down, using a solution of "Manger's improved sugar soap" and water, and finish by rubbing down with an abrasive paper. When all the damaged paint has been removed, any repairs that are required to the surface can be made in the same way as for new plaster. All repairs should be touched in, using a colour that matches the existing ground colour. The first coat should be a mixture of pigment tinted to the colour of the finishing coat, and the vehicle used should be three parts of turpentine and one part of linseed oil. The second coat should consist of pigment tinted to match the colour required and a vehicle of three parts linseed oil and one part turpentine.

PAINTER'S TOOLS

The principal tools required by the house-painter are shown in the illustrations. From these the amateur will have to make a selection, his choice being limited by his purse, the field of his activities and his personal taste. Skilled and effective workmanship is dependent largely upon good tools correctly employed. For some purposes there exists only one adequate tool: for others there are alternatives, but the amateur should never "make do" with a tool which is quite obviously unsuitable for the job.

Brushes

Fig. 2 gives two examples of distemper brushes. One, A, is known as the two-knot stock brush: the other is a flat-nailed stock distemper brush of the type known as a "Yorkshire." Both are efficient, but for the amateur a nailed stock brush is more generally useful, and much easier to manipulate. The pound, or ground brush, is distinctly a brush for working painters, but even among these it has declined in favour, and been replaced by the flat brush shown in Fig. 3. These flat brushes are made in various sizes. The $2\frac{1}{2}$ -in. flat brush will be found quite large enough for general purposes. The $\frac{1}{2}$ -in. and $1\frac{1}{2}$ -in. are also to be recommended, since they will cover a great variety of operations. Other brushes illustrated are sash tools, round and flat fitches, and dusting brushes of both the round and flat kind. A dusting brush will be required on every piece of painting you undertake; it is used for removing dirt and dust before you begin painting, and so preventing the colour from being sullied. The flat brushes,

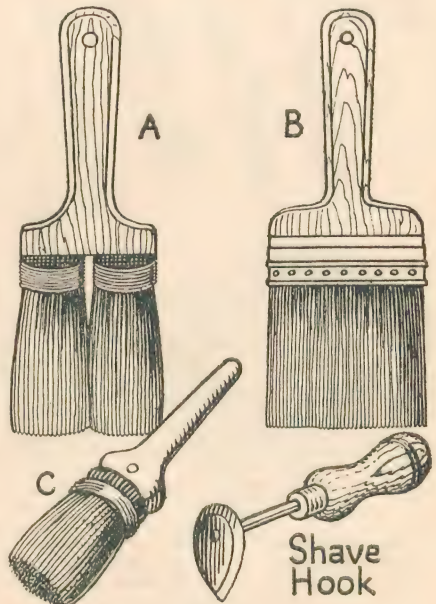


FIG. 2

- A. Two-knot stock brush
- B. Flat-nailed distemper brush
- C. Pound brush

particularly the 2-in., are most suitable for varnishing, and it is well when possible to reserve brushes for that purpose alone.

Care of brushes

Brushes of the best quality are more efficient in use, and are in the long run a real economy. The length of service they will give depends upon the care they receive from their user.

When work has been finished for the day, and is to be continued on the next day, they may be placed in water, but not upright in a jar, or the shape of their ends will be spoilt. They should be laid flat in a shallow dish, with their handles on the edge, so that they are not immersed. It is a better practice to wash and dry the brushes completely. If they have been put in water, they should be thoroughly shaken before starting work again, and "worked out" on a clean piece of board.

When painting is completed, the brushes should be rinsed in paraffin or any cheap solvent, and then well washed in soap and water to which a very little soda has been added.

The soap should be well

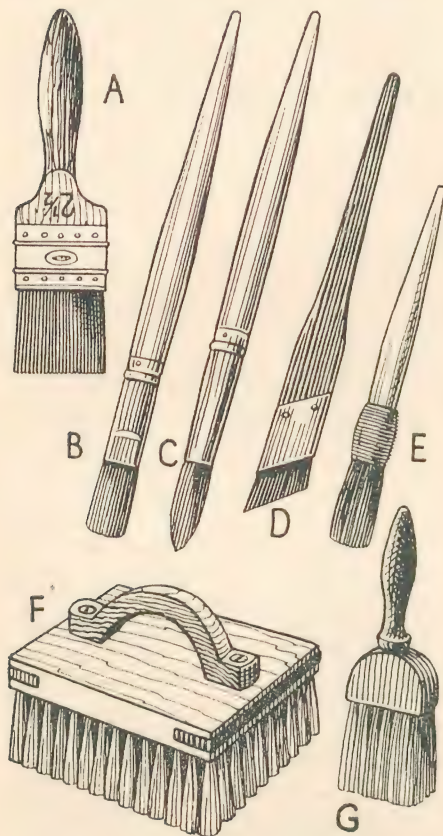


FIG. 3

- | | |
|---------------------------|-----------------|
| A. Flat brush | D. Lining fitch |
| B. Flat fitch | E. Sash tool |
| C. Round fitch | F. Stippler |
| G. Jamb brush for dusting | |

worked in to the stock of the brush, where the colour is most likely to remain, and worked out on to the palm of the hand until the brush is thoroughly cleansed. The water should be lukewarm; cold water will make the paint difficult to remove, and hot water ruin the shape. When thoroughly free of paint, rinse the brush in clean water, dry and put away carefully until required for further use.

Metal tools

Fig. 4 shows a broad knife, chisel knife, palette knife and stopping knife. All are useful. A broad knife is required for stripping paint and making surfaces good, and can be used for the removal of wall paper. Chisel knives and palette knives are both required for stopping.

All these tools are absolutely necessary and quite cheap to buy. Metal tools should be put away clean, and watched to see that they do not rust.

In undertaking interior work it is necessary to use dust sheets. These may be improvised, for instance

sheets which have seen over-long service in the household can sometimes be used.

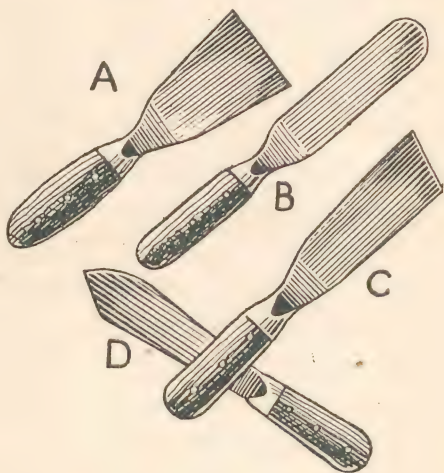


FIG. 4. METAL TOOLS

- | | |
|------------------|-------------------|
| A. Broad knife | C. Chisel knife |
| B. Palette knife | D. Stopping knife |

Scaffold boards

These boards, which are absolutely necessary for operations beyond normal reach, should be about 10 ft. long by 10 in. wide. At least two are needed. They must be kept clean and properly stored. The attic loft of the ordinary house will accommodate them conveniently and keep them in a decent state of preservation. The workman's personal safety depends on them, and great care must be taken of them. Boards which are carelessly used and stored develop splinters which are unpleasant and twists and distortions which are dangerous.

Steps, trestles and ladders

For outside work you will require a combination ladder of sufficient height to reach the roof level. Since this article is both expensive and inconvenient to store, it is better to hire one from a local builder or colourman. For internal work, two pairs of steps are needed for use with your scaffold boards.

Much of this necessary plant and equipment might be

co-operatively owned among householders in a particular district and administered through a ratepayers' or similar association.

Paint kettles of various sizes with proper handles and the necessary hooks to suspend them when necessary should be added to the foregoing list.

EXTERNAL PAINTING

It is important that the exterior of the house should be painted every three years and the materials used must possess the greatest possible durability.

From January until December the exterior of a building is subject to the greatest variations of cold, heat, rain and wind and without proper protection the materials from which it is constructed will rot and decay. Joinery work will open and shrink; putty will crumble and loose its grip upon glass; down-pipes, gutterings and metal fixtures will rust and perforate; stoppings which have been used to make joints sound will deteriorate and fall out. It is very easy to overlook many parts of the external structure, owing to the difficulties of carrying out a close inspection. Nevertheless, by overlooking a single trivial item in need of repair the work executed upon the exterior elsewhere may be wasted. A tremendous amount of work for example may be put into repainting windows and making mortar sound, and then because some small perforation in a down pipe or guttering has not been noticed, the work which it has taken so much time to do may be destroyed. Deterioration and decay spread very quickly where regular and adequate attention is not given. Because of the great care that has to be given to small details, this work is best entrusted to the owner, rather than to an outside workman who has no personal interest in it.

Good materials are more economical in the long run than cheap ones, but considerable waste will be involved if they are badly used, or applied over poor and inadequate preparations. Much excellent paint is wasted each year because it is put on to doubtful primings. All metal work must be painted over a surface which has been entirely freed from rust; work becomes entirely useless if the surface is prepared and the paint is not put on until several days later. All metal work to be painted must be prepared by using wire brushes, scrapers, and coarse wire wool: in

the case of gutterings and iron railings every particle of rust must be removed. When the surface is free, it should be primed at once before fresh scales form upon it, otherwise rust will continue to accumulate, and spread underneath the paint to cause a quick deterioration which will soon leave the metal totally unprotected. The best paint mixture for priming metal can be made from three parts of white lead, two parts of red lead with a vehicle consisting of three parts linseed oil and one part of turpentine. This priming applied at once will protect metal until further progress with the work can be attempted. A mixture of white lead paint and putty can be used for stopping.

Window-sashes need special attention. The commonest defect is shrinkage at the joints. It usually occurs where the top and bottom rails have not been properly painted, particularly in casement windows where the top surface of the upper rail and the lower surface of the bottom rail have been neglected. Before repainting, all dowels should be tightened and properly sealed with filling, and the putty in glazings attended to. The whole of the external woodwork requires washing and afterwards rubbing down with abrasive paper. All blisters and bad surfaces of paint must be removed in the same way. After this treatment the whole can be primed with a coat of good white lead paint.

As a treatment for stone facings, the writer does not favour paint. Such facings do require proper protection, and where it is found that owing to their very porous nature they have begun to crumble and powder away, they should be given a preliminary coat of petrifying liquid. This alone is sufficient to arrest decay in stonework, but if considered desirable, it can be followed up by two thin coats of an oil-bound water paint. When traces of decay are found, stonework should be thoroughly brushed and all loose particles removed. Any portions that then require treatment can be filled with a cement mastic applied after a coat of boiled oil. This mixture will set harder than the stone itself.

Cement facings should normally never be painted before they have been completed twelve months. If, however, it *should* prove necessary to put paint on earlier, new cement should first be given a coating of a solution which consists of 1 lb. of sulphate of iron dissolved in a gallon of boiling water. The solution should only be used when it is cold. When this is dried, a coat

of Duresco water paint will protect the surface. Water paint can be applied directly on to surfaces which have dried out and are mature. When a cement surface is found to be in a crumbling condition, a coat of leadless paint should be put on before the Duresco.

Rough-cast will sometimes develop fungoid growths in the presence of dampness, and if these are present the work should first be washed down with clean water to which a little carbolic acid has been added. This will destroy the growth and the rough-cast can be brushed down before it is given a coat of water paint for protection.

The principal entrance to a building deserves special consideration. Before painting your front door, all fittings should be removed. An examination of the existing paint will determine whether any special preparation is required. If the paint is cracked and blistered, it will need to be removed with a blow lamp, and afterwards made perfectly smooth and primed. Broad knives and scrapers are used to ensure the perfectly smooth surface required, and the work is finished with abrasive paper. The correct surface can only be obtained by rubbing well down and building the surface up with a series of coats of paint. If a varnished finish has been decided on, the door must be given three or four coats of flat paint and completed with two coats of varnish. But if a high gloss finish is going to be used, then a linseed oil priming will be followed by a coat of flat paint. The treatment of the fittings depends on what they are made of, iron, bronze or rustless steel. Even if of rustless steel, they require looking after. The best means of keeping this substance clean is to wipe it over with a damp soft cloth. Oak doors will require to be first washed down before rubbing them over with a medium glass-paper. The surface is then best treated with a coat of linseed oil.

BURNING-OFF AND SOLVENTS

There will be occasions when surfaces to be repainted are blistered and otherwise troublesome. Such surfaces will have been repainted so often that they have become overloaded. The surface may be lifeless, though quite sound, but when new paint or varnish is applied over the old surface blistering will rapidly occur.

The medium of the old paint when it has dried up or evaporated loses its grip on the surface, and any new paint applied over this will pull outward in the process of drying when affected by the warmth of the atmosphere. The old paint leaves the surface causing it to blister; furthermore, varnish applied over the old paint is, owing to its brittle nature, very prone to blistering.

Blistering also occurs when moisture has been sealed in the wood by the paint film. Any damp in wood which has been painted has difficulty in escaping when subjected to warmth and to consequent evaporation. Under these conditions the paint cannot penetrate the surface sufficiently to allow proper incorporation of paint and surface. When the moisture leaves the wood it usually brings the paint film away with it, and blistering results.

Similarly unseasoned timber or any internal dampness causes the paint to blister, and when timber is suspect a modification of the priming coat is advisable. Wood priming usually consists of two parts oil to one part of turpentine. When used for the purpose of priming unseasoned timber, reverse the quantities, making it one part oil and two parts turpentine. A mixture of this nature will penetrate the wood readily, and this will lessen the pull of the subsequent paint coats. The priming of timber should not be delayed, and where dampness exists a coat of good water paint will often do all that is necessary to protect the wood while it is drying.

Blistering is seldom prevalent where surfaces have been treated with flat paint, but where oil or varnish constitute the finish, it seems to be aggravated by excesses of these mediums. A priming coat made from japan gold size in the proportion one part to two parts of turpentine should be followed by a second coat in which the japan gold size has been increased. This will successfully protect the grain of the wood. Well rub down with waterproof glass-paper and water before the surface is finished by using a third coat mixed with two parts of gold size and one part turpentine. Finally, these should be protected by two coats of varnish; the first coat must be well brushed in and the last coat applied rather fuller. The gold size used for the purpose should be of good quality.

When preparing surfaces which are blistered, the old paint must be entirely removed before applying new paint, and the

surface as carefully prepared for treatment as if it were new work. The paint can be removed quite simply by using a burning-off lamp. Two different types of lamps are supplied for this purpose—those which use benzolene or petrol, and those which use paraffin. Burning-off lamps seldom get sufficient attention, and in consequence tend to become unreliable. Some people are a little scared of using them. The principle is the same as that of the Primus stove, and with proper attention and care they are reasonably certain in use. The jet, which is kept free by using a pricker, should not be allowed to

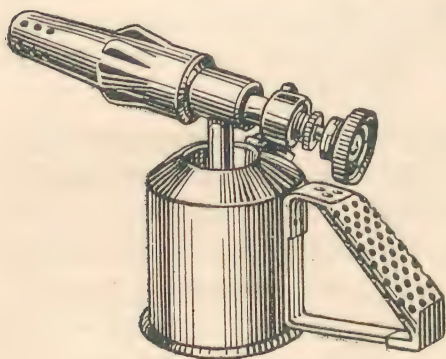


FIG. 5. BLOW LAMP
For burning off the old paint

clog. The instructions supplied should be studied and intelligently carried out. The lamp must be lighted in a suitable place; make sure that the stopper is screwed up properly. A petrol lamp can be got ready for use more quickly than the paraffin burning type, and has advantages in that it produces great heat and does not carbonize. As it burns petrol,

care is necessary; also proper appreciation of the inflammable nature of the spirit. To start the lamp, the burner and vaporizing tubes require heating, whether it burns oil or spirit, and when these are hot give a slight pressure to the pump, only sufficient to replace the spirit the flame has consumed. Usually there is a tendency to use the pump too frequently, which places the spirit under too great a pressure and forces the liquid instead of the vapour into the burner, with the consequent risk of explosion. Keep the plunger down while the lamp is burning, otherwise the washer becomes overheated and destroyed. Screen the lamp from the wind as much as possible when using it, and to extinguish the lamp close the valve; the lamp being warm will continue to vaporize. Let it cool down as rapidly as possible. The filling cap should be released only in the open air.

Tools required when stripping the paint will be a broad knife and a shave hook. Use the broad knife for the flat surfaces, and the shave hook where mouldings occur. The burning-off must

be done with care, and the lamp should not be allowed to char or burn the surface. The stripping should be done without cutting or scoring the surface of the wood, otherwise a fresh course of filling and preparation will be required before the work can be repainted.

The operation is quite simple, but you will need to be quite comfortable and at home with the lamp, otherwise your attention will be divided and the surface will become scarred and marked.

Keep the lamp screened as much as possible in draughty situations. If the burner gets clogged or the jet stopped, they must be attended to at once. Be careful not to chip or cut the surface when using the knife.

The flame is used to heat the paint and so soften it. Start at the bottom and have the lamp near enough to the surface to heat the paint properly, this will conserve the heat. Then with the knife follow the flame, lifting the paint film as you proceed. Remember the paint can only be lifted while it is heated. Flat surfaces must be completed first and

the mouldings afterwards. All paint must be carefully removed, however many coats exist, any particle which cannot be so removed must be finally cleansed by rubbing down with pumice stone and soda water, or with painter's sugar soap. Waterproof glass-paper will clean the surface of paint if the action is sufficiently drastic. The surface will afterwards require to be prepared as for new wood, and rubbed down well, filled and primed. (See treatment of surfaces.)

Solvents or paint strippers

These are seldom satisfactory, though a number of proprietary brands are marketed. The use of these is invariably unpleasant

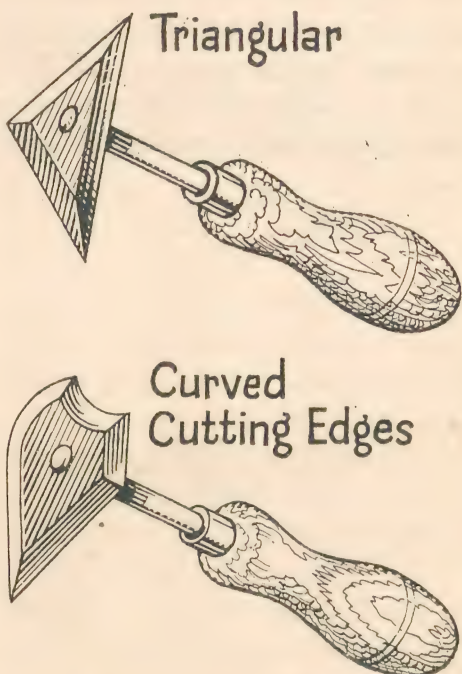


FIG. 6. TRIANGULAR SHAVE HOOK. SHAVE HOOK WITH CURVED CUTTING EDGES

and costly, also they give rise to unpleasant fumes. The action of most strippers is limited to the removal of one coat of paint at the time; also, being inflammable, they involve precautions against fire. Instructions which include care for the after treatment of the surface should be followed carefully. These include washing down with turpentine or methylated spirit, and in some cases where they contain caustic soda, the use of a neutralizer. For this, acetic acid or vinegar is necessary. Caustic soda in conjunction with potash is used as a paint solvent, but it is not advised for the amateur. If it is used the very greatest care must be taken of hands and everything that surrounds them as this solvent has a very drastic burning action.

CHAPTER XXVII

CAUSES AND CURE OF FAULTS

Defects of plaster surfaces

Many causes can account for defects in the finish of a plaster surface. Surfaces may not have been properly prepared, unsuitable materials may have been used for the work, or materials used may have been applied carelessly. Care must be taken to eliminate such defects as far as possible.

Stains in plaster work

Before starting to remove stains in plaster work, the cause must be ascertained and dealt with. All stains should be scoured with hot soda solution, and afterwards thoroughly washed with cold water. Any defects in the surface may be then be made good by filling with plaster of Paris and oil-bound water paint. This filling should be made up with equal parts of both ingredients, and thoroughly mixed to a workable consistency. A ceiling which is found to be badly stained should be given a coat of "Duresco" white, No. 252. This will produce an effective and clean surface. Very stubborn cases may be given a coat of white knotting, which should be followed with a coat of sharp white lead paint. The paint mixture should be compounded of paste white lead, driers, five parts of turpentine and one part of oil or varnish. Ceilings which are only stained in parts are best dealt with by the application of lining paper over the affected portions. When this lining paper is put on, the edges should not be pasted down but left loose. This is done in order that when the paper is dry these loose edges may be torn away to produce a soft edge which will not be noticeable after the decoration is complete.

Crumbling ceilings and walls

In cases of crumbling in the plaster of ceilings and walls, the surfaces must first be cleared as far as possible of any loose matter. A coat of flat leadless paint should be applied to the

entire surface; "Silpaco," a ready mixed paint, is recommended as specially suitable. The surface can often be brought to the right absorptive condition by the use of a coat of petrifying liquid. As an alternative, a thin lining paper can be put on.

Walls with imperfect surfaces

Holes, cracks and defects in the plaster should be made good with a filling composed of equal parts of plaster of Paris and water paint. There are occasions when severe irregularities occur and cause the required filling to be very laborious work. In such extreme cases, after the worst portions have been filled the surface should be lined with a stout lining paper. It should be finished by being distempered and rubbed down with glass-paper. It may, if the surface has been badly damaged, require to be distempered twice. Any deep depression can be filled with the mixture of plaster of Paris and water paint applied with a broad knife and finally rubbed down with a medium glass-paper. When the finished surface is to be scumbled the same treatment may be used, and then the surface should be lined with a thin but good quality lining paper.

New plaster surfaces

Before being painted with oil paint these surfaces must be thoroughly dry. If they are not dry the film will seal the top surface and lock the moisture in. This will cause the paint to become streaky, and when it does occur the paint must be entirely removed to allow the normal drying of the plaster. If the plaster is suspected of being insufficiently dry a washable distemper can be used. This will not interfere with the normal drying of the plaster.

Keen's cement

This material dries with an extremely glossy surface and it is necessary to specify individual treatment for painting it. This glossy surface affords an extremely poor key for the adhesion of paint, and when possible it should be painted as soon as the surface is hard enough to bear the pressure of the brush. A very thin white lead paint should be used as a first coat.

Rust stains on plaster

If the stains are small, they should be cut away and then filled in, or, if they are too large to be dealt with in this way, a coat of white knotting should be applied before the surface is decorated.

Paint becoming soft on plaster

When this occurs, it indicates that the surface has been painted before the plaster was completely neutralized and the paint will have a sticky appearance. The parts affected should have the paint removed by the use of turpentine. After this has been done a neutralizing solution of zinc sulphate should be applied to the defective parts. A solution of diluted acetic acid would also answer for this purpose for small patches. When plaster is suspect for this reason, a solution of sulphate of zinc 2 lbs. to one gallon of water should be applied to the surface 24 hours before painting. The paint should then be applied directly over it. Water paint supplies the most efficient treatment for immature plaster work.

Paint peeling from plaster

This indicates an insufficient key for the paint. Plaster which has been finished with a hard glossy surface must be prepared before paint is applied. For this preparation wet the wall with water and rub down with waterproof abrasive paper until the surface has been slightly roughened. The first coat should be a sharp paint produced from white lead and a small quantity of patent driers, the vehicle consisting of copal varnish one part, linseed oil one part and turpentine six parts. If the plaster is lightly stippled when applying the paint a more efficient key will result and this will assist the adhesion of subsequent coats.

Paint drying with white streaks upon plaster

This will sometimes occur when lithopone paints are used and may be the result of chemical action set up by the plaster. A sealing coat should be applied, after which the surface may be repainted.

Paint blistering on plaster surfaces

New plaster is apt to "blow" owing to small portions of unslaked lime contained on the surface becoming active and

disturbing portions of the paint film. When the surface finally settles, the only treatment is to repaint it.

Paint losing gloss

This results from absorption into the plaster, and may be aggravated by traces of alkali in the surface. The application of zinc sulphate solution, a neutralizing agent, which is always useful when dealing with new plaster, would have prevented this.

Paint darkening on plaster walls

This will frequently occur with white and off-white tints, and results from the action of the atmosphere during the process of oxidation of the vehicle used in the mixture. Such oxidation often causes disturbances of the colour content, but the use of fine quality refined linseed oil will mitigate the amount of darkening. If the disturbance occurs in the form of yellow streaks, this will probably have resulted from alkali content contained in the plaster. In either case it can only be remedied by repainting.

Repainting compo fronts

Before repainting most careful preparation will be necessary to see that any suspect portions are scaled off and built up again and a fresh priming coat given.

Dampness

Dampness will always cause trouble when dealing with external compo work and therefore such work should be painted when conditions for dryness are favourable. When dampness has affected the compo it will be most troublesome in the base of the front and usually it will be found to have deteriorated at the back surface of the paint film. As usual in preparing work these damaged portions must be removed and the surface repaired. External work will, during the process of time, collect dirt and grease from the atmosphere, so to give the new paint a really good start, well wash it down and cleanse the surface, finishing the preparation of the surface by rubbing down with abrasive paper.

Blistering

This occurs principally on external work, and may result from various causes. Moisture which has been sealed in with

film will crack the surface under the influence of the heat of the sun. The moisture, evaporating outward, lifts the paint film and causes blisters. When this cause is suspected, use a more penetrating priming mixture, consisting of turpentine two parts and linseed oil one part. This provides better adhesion and stronger resistance to the pull when subjected to the warmth of the sun.

Blistering on old work

The old paint should have been stripped or burnt off before repainting. Often old paint has not sufficient grip of the surface to counteract the pull of the fresh paint, and this will cause the new work to lift and blister. External work should always, before painting, be carefully prepared with a *modification* of the paint vehicle, by which the oil is reduced, or gold size substituted. The surface should be finished by varnishing, after which it will be less likely to blister. The priming coat should contain a vehicle consisting of one part japan gold size and two parts turpentine. A second coat, increasing the quantity of gold size follows, after which the work is finished with the required colour. The vehicle used is japan gold size and turpentine one part. After this the surface will require two coats of varnish. The first coat should be brushed out, and the final coat made slightly fuller. Before applying the finishing coat, the surface should be rubbed down with waterproof abrasive paper and water.

Knots

Knots should be properly sealed before painting, and for this purpose good quality shellac knotting must be used. Two coats should be applied. When the knot is oozing resin and is stubborn, it should be entirely removed and the surface made good by using an ordinary filler. It is important that the knotting should be quite dry before any priming coat of paint is given. Should it be found that any knots have been inadequately treated, a further coat of knotting should be applied when the first is thoroughly dry. When knots become apparent through a coat of paint, the latter should be completely removed, and afterwards a further application of the knotting made. If, after the surface has been finished, yellow stains appear in the vicinity of the knots, it is because of the active state of their resinous

content. They should be left until the wood settles down properly, when they can be repainted without further trouble.

Painted surface losing its gloss

Grounds are sometimes abnormally porous when they are not properly cleaned before painting. This may also be due to the painter having been too liberal with the boiled oil when thinning the paint, or to the use of faulty paint. In any case, the only remedy is to repaint the affected surface.

Paint powdering

Some pigments need to be protected when they are used as a finishing coat for external work. Powdering is a usual indication of disintegration of paint mixtures. To avoid this, titanium white should be mixed with zinc oxide if the latter is being employed for the finishing coat. The result will be a paint possessing a hard-wearing film of unusual density and excellent colour content. White lead paint sometimes suffers from powdering: it can be remedied by the addition of copal varnish of between 10 to 20 per cent. in the finishing coat. Alternatively, the addition of 25 per cent. of zinc white will render the paint reliable. A surface built up of successive coats of flat paint, and afterwards efficiently varnished, will get all the protection required to give a sound paint film.

Crumbling paint

This trouble arises with many of the earth pigments requiring the addition of a medium to supply the necessary protection. Protection is adequately provided by the addition of varnish, which produces a hard durable film.

Paint used in seaside towns

Sea air is especially destructive to almost all pigments. The medium used should receive particular attention. It has been found that paint mixtures constructed of white lead with 25 per cent. of zinc oxide give the greatest resistance to sea air.

Paint cissing or crawling

The surface will resist the uniform spreading of paint, suggesting the existence of a hostile element. This trouble can be

overcome if the surface be washed with water having a small quantity of whiting dissolved in it. Before continuing painting the surface should be leathered off with clean water.

Smoky surfaces preventing proper drying

Surfaces receive many impurities from the carbon deposits of a smoky atmosphere. These adhere strongly, and on affected parts requires special treatment to allow the film to function properly. The treatment consists of the application of a coat of hot jelly size, which should be allowed to dry and be afterwards washed off.

Paint scaling from ironwork

Ironwork should be quite free of rust before any paint is applied. Wire brushes and steel wool can be used for this purpose.

General hints

Varnish provides an extremely hard film, but it should not be applied over an oily or elastic paint. The surface upon which a varnish or hard gloss finish can be successfully applied must be matt, one in which the turpentine forms a considerable proportion of the vehicle.

Sufficient time should be allowed for each coat of paint to dry, otherwise the surface will be sealed by the new coat, and the undercoat will not dry hard and will become indifferently elastic. The result will be cracking of the second coat. Paint applied too thickly owing to the insufficient fluidity of the vehicle will not spread properly and will dry unevenly. This will result in cracking. In the case of gloss finish this lack of uniformity in the drying will cause deterioration of the gloss. Gloss paints containing an excess of driers, especially liquid driers such as terebene, gold size, etc., are liable to crack. This defect will be more acute if they are applied over an oily undercoat. Flattening should always be applied over an oil coat before the oil has become hard dry. The flattening, which should be minus both driers and oil, obtains proper adhesion by its solvent action upon the oil, thus furnishing sufficient adhesion for successive coats. Boiled oil should not be used with paints

constructed mainly from lead. This oil being a powerful drying agent, will supply more driers than are required by lead paints.

Flat enamels

Flat enamels should be applied upon a flatted surface. A waterproof abrasive should be used, and the surface rubbed down carefully before the application of each coat.

Stoppings

Stoppings are used for repairing defects in woodwork such as surface cracks, crevices, nail holes, etc. The wood has first to be primed and the surface rubbed down. All dust must be removed before the stopping, which for general purposes may be linseed oil putty, mixed with a little white lead, is applied. Stopping should be done as neatly as possible and applied in small pieces. Two applications, using small quantities, will be more successful than when large pieces are forced in. All defects at joints, etc., must be carefully filled.

Fillings

These are used in order to achieve a better finished surface than is obtainable by the normal application of paint. Bruises, rough patches and other irregularities of surface would, if not so treated, be exaggerated when painted. Motives of economy sometimes cause these defects to be scamped, but when a first-class job is required they must be properly treated. Fillings are usually applied with a broad knife, and the repeated applications of thin coverings are better than heavy ones. When the filling is quite dry it should be rubbed down with glass-paper, after which all dust should be removed and a thin coat of glaze composed of equal parts of varnish, turpentine and linseed oil given to the surface. A suitable filling can be prepared, using whiting and size incorporated with sifted plaster of Paris. Weak jelly size may be used, but a reliable brand of water paint will take the place of the whiting and size. Oil fillings which are prepared from paste white lead and gold size, and stiffened by the addition of whiting, are also used; they dry extremely hard, but are not recommended for use by amateurs.

Rubbing down

This process is essential at many stages of the work, and the thoroughness with which it is carried out marks the difference between good and shoddy work. The object of course is to remove irregularities. Where lead paints are involved, water

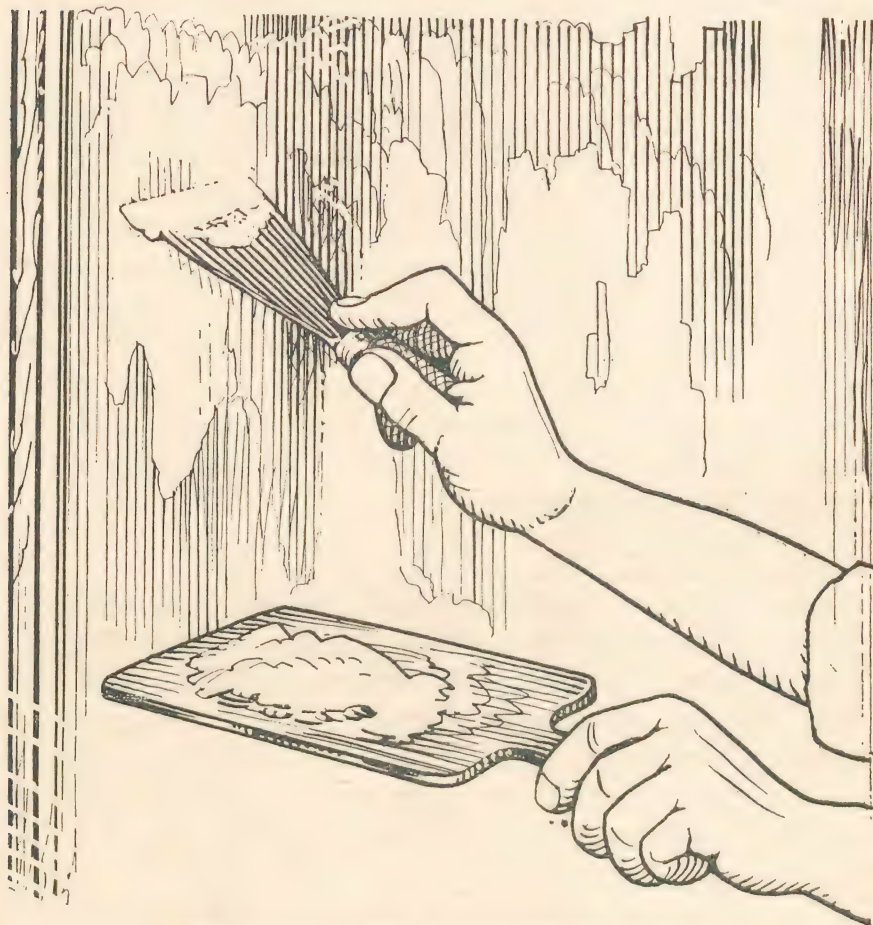


FIG. 1. APPLYING FILLING TO A BRUISED SURFACE

must be used. Pumice, or waterproof abrasive paper, may be used on hard surfaces; otherwise glass-paper may be sufficient for the purpose. Care must be taken to avoid unnecessary scratching of the surface.

Knots

Knotting must always be of good quality. After the knots have been coated with the knotting, it is an advantage to touch

them up with a sharp paint, confining the applications to the area of each knot.

Priming

Invariably the priming coat will consist of white lead with sufficient red lead to colour the mixture to a decided pink, the vehicle being three parts linseed oil to one part of turpentine. The oil content should be carefully adjusted, especially when wood-work is exposed to the elements. Driers should be such as are required to suit the weather conditions prevailing. Priming, since its object is to protect the material, should be undertaken at the earliest possible time. It should be applied thinly and well brushed out. Wherever stoppings have been used, care must be taken to see that these are efficiently covered, otherwise they will shrink and drop out. The coat of paint given after priming will require to be less fluid and of greater body, and should be applied so as to produce a surface of uniform colour. The vehicle must be consistent with the intended progress of the work. The third coat will, of course, have colour content associated with finishing tint.

Excess of driers

Excess of driers usually gives faulty surfaces: lead pigments generally require less than other pigments. Titanium white, being absorbent by nature, will require more driers than lead paint. Usually the increase of quantity will be paralleled by the increase of linseed oil in the mixture. The consistency of the final coat of paint needs to be round, not thin. When a hard gloss finish is required, substitute varnish for oil.

INCIDENTAL REPAIRS

Inspection of the general structure of the house should be made periodically. Prompt attention to apparently trivial defects will frequently avoid the need for more costly repairs later on.

The interior of a house usually receives a fair amount of attention, but to ensure a reasonable permanency for any decoration the whole structure must be kept in good repair. Under the various sections of this work the chief structural features requiring maintenance are dealt with: our present concern will be limited to their association with decoration.

Metals

Iron-framed windows and fittings require regular attention to keep them free from rust. No purpose is served when painting metal if a film of paint is put over the rust. The rust must first be eliminated by thoroughly cleaning with a wire brush. Cast iron is a simple material to preserve, since the adhesion of the paint film is greater. Hinges and fittings are easily kept in working order with oil. Oil-starved fittings have to be replaced, and, apart from the labour involved, replacements are frequently difficult and sometimes impossible to obtain.

Plaster work

Plaster work, which plays so large a part in lining of the shell of the house, deserves particular consideration. The nature of this material renders it liable to fracture, bruising, and also drying cracks. Structural defects have a habit of revealing their existence by cracks in the plaster-work of walls and ceilings. The remedy for such cracks cannot be usefully applied until the cause has been removed. The section of this work which deals with structural maintenance gives the information which will enable you to diagnose those various structural defects. (See Section II, Vol. I.)

Cracks resulting from shrinkage and drying present few difficulties since they are usually of small dimensions. The plaster adjoining such cracks should first be cut out to give a v-shaped section, after which the gap can easily be filled in with plaster of Paris or Keen's cement. The latter is slower of action and it allows of more time in which to do the work. It is well to mention here that before applying new plaster to older work the cracks should be brushed over with water in order to give better cohesion. This prevents the repair from shrinking away and eventually falling out. Wall bruises can be made good in the same way. Where they are small, plaster of Paris mixed with a little cement will prove quite satisfactory. The surface of the repair should be smoothed off as neatly as possible. When repairs to plaster work of a more serious nature are involved, such as those resulting from wear and tear, quite large portions of a ceiling or partition wall may require renewing. Water from leaking roofs, or excessive dampness aided by vibration often cause the plaster to loosen upon the laths. In such cases all

loose parts surrounding the damaged portions must first be removed. Loose portions are easily detected if the surrounding surfaces are prodded with a stick! A slight movement indicates that the surface is not being securely held by the laths. When

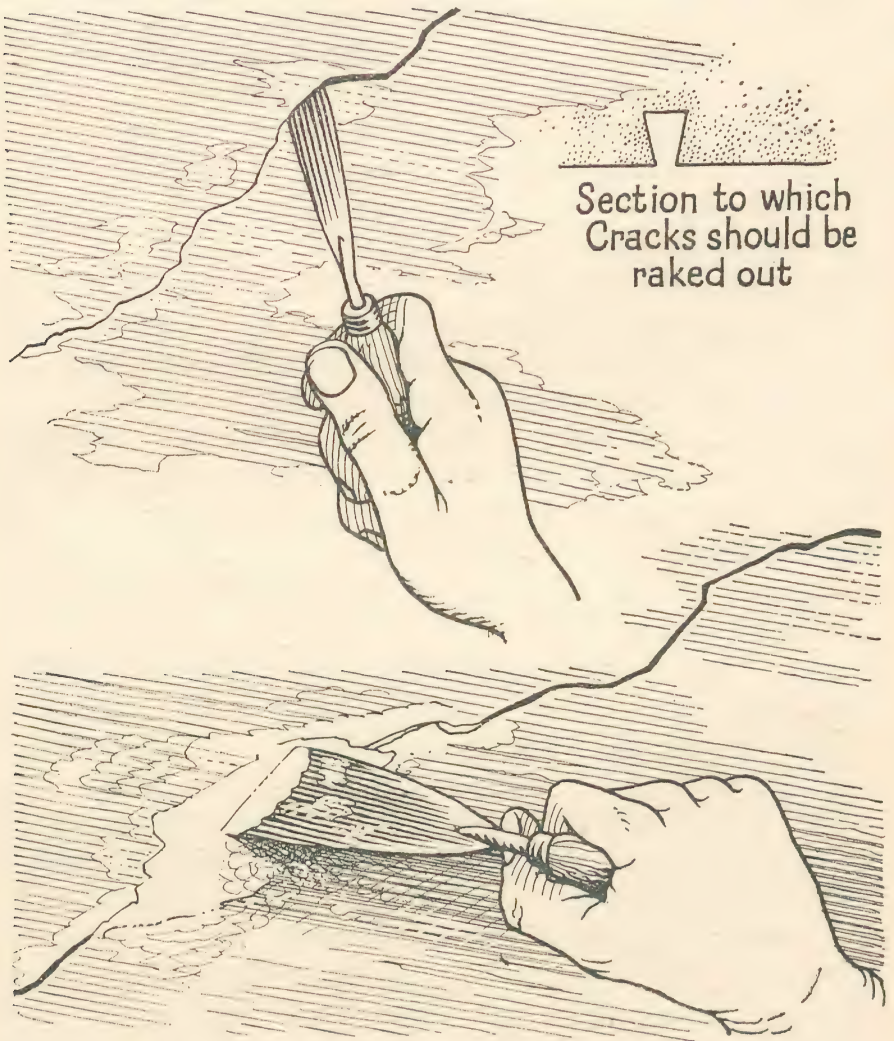


FIG. 2. CUTTING OUT AND FILLING A SHRINKAGE CRACK

the preliminary examination has been completed, and the extent of the repair ascertained, examine the laths to make sure they are in proper order. The subsequent work can then be done in two stages. In order to prevent stains on the old work, which will possibly occur as the new plaster dries out toward it, it is advisable first to paint round the old edges and let them dry

properly. This will make the new plaster dry *outward* and prevent staining from the spreading of the moisture. The laths after they have been wetted can receive the first coat of

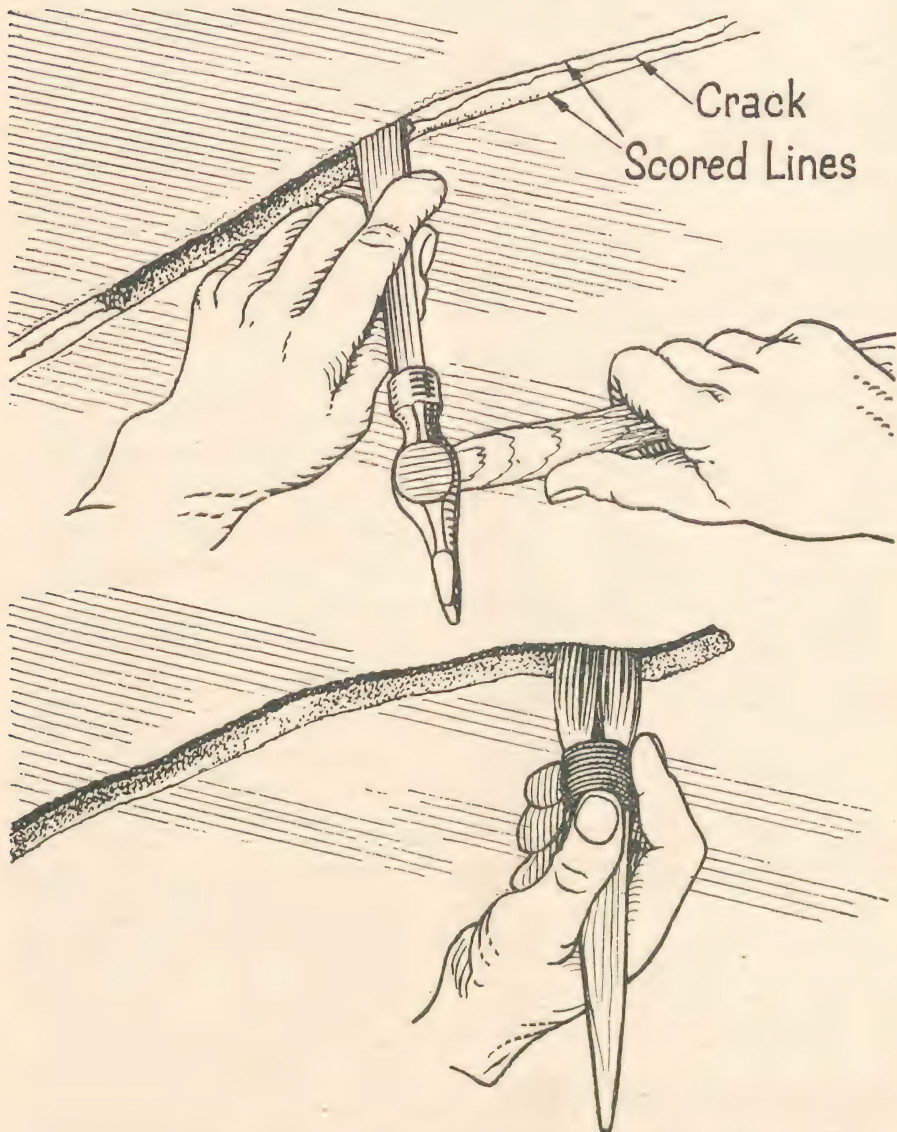


FIG. 3. CUTTING OUT AND WETTING IN A WIDE CRACK

Keen's cement with which some silver sand has been mixed. This is adequate for the work if care is taken to make a good key with the laths. When the first coat is finished, score over the surface in order to give a key for the final coat, which must not be applied until the first is properly set. The finishing coat can be

of Keen's cement alone. Bring the surface up flush with the old work, again using care to make a really good surface.

All surfaces should be perfectly sound before any decoration is commenced, or the work will accentuate any defects which already exist. Before papering a newly plastered wall, it should be allowed to dry and season thoroughly, otherwise such work as is done can only be of a temporary nature. The presence of an alkaline in the wall will cause stains and discoloration of the paper. Where a temporary decoration only is required, a cheap

yellow-tinted paper can be used, thus rendering stains less obvious. Additional precaution could be taken by first lining the wall with a medium-weight lining paper. The more permanent decoration can then be postponed until after the wall is seasoned. A new wall does not require much preparation. It should be free from dirt, and may need washing if it has been soiled. The surface must be examined for any cracks which exist, and these

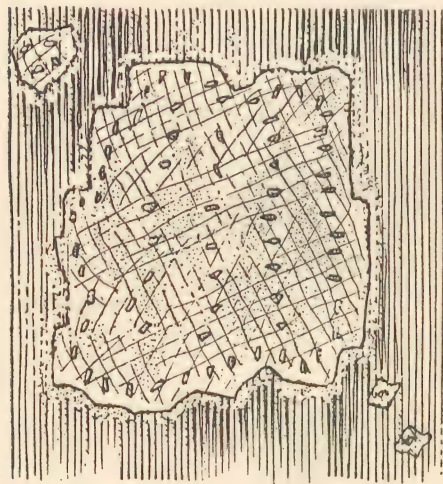


FIG. 4. FIRST COAT ON LARGE REPAIR
SCORED TO PROVIDE KEY

can be filled with a mixture of equal parts plaster of Paris and whiting moistened with weak size; the size will help adhesion and make the mixture easier to work. The wall can then be lightly rubbed down with sand-paper to clear away any irregularities of surface, and should receive a coat of weak size to equalize the absorption, after which the work may proceed.

Papering over distemper

Where walls and ceilings have been decorated with size-bound distemper, the surface must be thoroughly cleansed. An old stock brush and water is generally used for this purpose, and every trace of the distemper must be removed from the surface before applying the paper, which otherwise will not adhere properly. On the other hand, if an oil-bound distemper has been used, the surface should be scraped down to remove any flaking portions,

after which the wall must be washed down with water, and the surface rubbed down with coarse sand-paper. Wherever an old paper exists it should be removed before the new paper is hung. The moisture of new paste usually finds the weak spots of the old paper, and is responsible for the blistering and frayed edges which often occur and ruin the new work.

To strip old paper

To remove the old paper use a broad knife, warm water, and an old stock brush. Saturate the paper well, starting at the top of the wall, work downward to the skirting, taking care not to use too much water or it may pass through the cracks of the floorboards, causing damage to the ceilings below. Soak the paper frequently and then strip with the knife which should be held at an obtuse angle to the wall. Should there be several layers, you will find it more satisfactory to remove one paper at a time.



FIG. 5. USING BROAD KNIFE IN STRIPPING OLD WALLPAPER

When papers have been varnished, their removal is more difficult. A strong solution of common soda is effective, but in using this be careful not to allow it to get on the paintwork, as its caustic action will damage the paint. Another method is to prepare a fairly stiff paste, and while this is still hot dissolve into it a quantity of good sugar soap. The paste will give the soap body and render it slower drying. By applying this to the surface of the paper the varnish will be softened and can be scraped away. The paper can then be treated with hot water and stripped from the wall. My own experience has proved the soda solution the most generally satisfactory. After the paper has been stripped the wall must be thoroughly washed down and cleansed of all traces of the solution. Any penetration by the soda into the new paper will cause deterioration and staining.

Sometimes an old varnished paper can be left on the wall, in which case it should be thoroughly cleansed of dirt and grease and then rubbed down with sand-paper. Before hanging the new paper, give the wall a coat of weak size with which a small quantity of whiting or distemper has been mixed, first making sure that the surface of the old paper is perfectly sound.

Superficial treatment for damp surfaces

In dealing with damp, various expedients are used to serve as temporary measures. Tinfoil, tarred paper and waterproof paper have all been recommended to cover the plaster to form a damp resistant, but the removal of the primary cause is the only sound solution. Most temporary devices serve merely to spread the moisture and the accompanying stain over larger areas. Damp, or no damp, the surface of any plaster work must be in a sound condition before any decoration can be successfully applied. Old plaster on ceilings and walls presents a very poor surface when crumbling and powdering are present, and in order to give them more solidity they should be coated with petrifying solution. Alternatively, a coat of paint may make the surface sufficiently sound for the work to proceed satisfactorily, or the application of a lining paper will render the same service.

Stains caused by damp

Stains caused by a leaking roof are usually worse at the edges of ceilings, and any flooding with water will intensify these unpleasant indications. To remove them, they should be first scoured with hot soda water and then rinsed in cold water. When the wall is dry apply a coat of white knotting, and follow this by giving a coat of paint composed of white lead paste, driers, turpentine five parts and varnish one part. If the whole of the ceiling is bad, a coat of clearcole, made of jelly size and flour or plaster of Paris, will keep the stain back. Size distemper over this would dry perfectly clean. If the stains are caused by any oily liquid, such as paraffin, the portions affected must be cut out and replastered. A ceiling partly stained may be lined to cover the stained portions. All interior woodwork should be filled wherever defects from shrinkage or other causes occur, and plaster walls should be allowed to dry and season thoroughly.

When painting is contemplated this precaution is essential: a great number of painting faults are due to this precaution being ignored. When such troubles arise, the removal of the paint is the only remedy; apart from the expense, it is exasperating if, after much labour in applying the material to an unseasoned wall, you discover streaky places in good brushwork, or unpleasant stains which spoil the tone and colour you have used—the defect being generally due to the alkaline content in unseasoned plaster.

Walls which have been previously painted require considerable preparation before substituting paper for paint as a covering. The wall suction is fully stopped with the oil of the paint, and, in addition, the glossiness and grease will cause the paper to slip about, unless the surface has been fully prepared. Paper will also show a tendency to open up at the seams. To remove the paint is difficult and expensive, and therefore as an alternative some treatment which will remove the gloss of the paint is advisable. One method is by giving the surface two separate coats of a solution of silicate of soda, 2 ozs. to one gallon of water. When the gloss has been removed, the surface should be well rubbed down with sand-paper, and finally given a coat of weak jelly size to equalize the absorption.

CHAPTER XXVIII

VARNISHING AND WAX POLISHING

For success, this operation relies upon cleanliness—the use of clean tools, clean containers and freedom from dust or grit within the field of operations. Brushes to be used for varnishing are better when they have been broken in. New brushes will not spread the varnish so well, and the shedding of loose hairs will entirely spoil the work. A dusty floor will deposit grit and dirt on a surface owing to the movements of the operator during his work, and care must be taken to work in a dust-free place.

The properties of a good varnish are toughness and hardness, and, in certain cases, the resistance to humidity.

The most effective ground consists of a number of coats of flat paint, all of which have been carefully prepared by filling and rubbing down. Failure to prepare the surface properly will exaggerate any defects that exist. Before varnish is applied to the surface, the latter should be washed down and wiped with a chamois leather, otherwise a fault known as “cissing” may occur. This is easily detected, for when it exists the varnish will not spread evenly, but will have the appearance of water placed over an oily surface. When “cissing” occurs, remove the varnish and prepare the surface again.

The proper storing of varnish is important, and observance of the following precautions necessary. Being susceptible to atmospheric temperature, it should never be stood upon a cold floor, but placed upon a shelf, and if possible, in a temperature not below 60 degrees F. There is likely to be a small amount of free spirit in the container if it has been standing for some time and this should be released by removing the stopper, and placing a piece of muslin over the opening to keep it free from dust during the period it remains open, which should be for about an hour. This allows the spirit to escape.

The application

Varnish must always be applied over a flat ground. It must not be preceded by an oily coat of paint or “cissing” will follow

and result in the cracking of the surface. All brushes used must be clean and free from dust or grit. When applied, the varnish requires to be spread, and should not be brushed out, as with ordinary paint. Load the surface, but do not overload, as the varnish must not be allowed to sag. Draw the brush down the surface, leading the varnish with it. Practice alone will give that lightness of touch which is all important to the varnish film. Two coats are better than one: the first coat will not need to be so full in quantity as the final coat. Overloading causes ridges, which will eventually crack. Some advantage is gained by rubbing down the first coat after it has thoroughly dried. This is termed "felting," and is done with pumice powder and water. Fine waterproof glass-paper may be used, and the operation continued until the surface becomes "matt." Allow about 30 hours for the varnish to dry and harden before completing the work.

Flat varnishes are more difficult to apply, as these contain a fair proportion of spirit, and when the undercoat has been insufficiently bound they are apt to "lift" during their application. The nature of the varnish product causes difficulties in spreading because of the rapidity with which it begins to dry, thus making it difficult to successfully bring the edges together. Flat varnishes require stirring before use, in order to incorporate completely the materials from which they are prepared. When a flat varnish produces a bad finish, with alternate streaks of gloss and "matt," a second coat should be given after the first has hardened.

Spirit varnishes

These are of not much value in decoration, but when used they should be applied speedily, and in a warm temperature, on surfaces which are free from dampness. They dry so rapidly that only skilful manipulation will keep the edges sufficiently alive to make them join efficiently.

There are many different varnishes prepared, and though general needs may be supplied by using copal for internal use, a good oak varnish is necessary for external use, and a general purpose varnish for other requirements. Any information regarding selection for special purposes may be obtained from the paint-merchant's lists.

General problems

Dampness and humidity after a hot day by settling upon a partly dry film will cause it to "bloom." This may not be constant, but alternate with changes of temperature. Washing with warm water while the work is dry and rubbing it down with a chamois leather will sometimes remedy the difficulty. An alternative remedy is to polish the faulty surface with the old-fashioned furniture polish, which consists of equal proportions of raw linseed oil, vinegar and methylated spirit. Otherwise it should be rubbed down with fine glass-paper and water, and re-varnished under more favourable conditions.

Smoke, grease and dirt

Smoke, grease and dirt, with which the atmosphere is invariably charged, will cause many little defects to a varnished surface. These are pin-holing, pitting, and awkward air pockets. These, however, seldom occur if the surface has been washed down and leathered before the varnish is put on. Gritty surfaces of which mention has already been made are produced by dirt. Varnish applied over an oily ground will crack; so will the application of a quick drying varnish over a slower drying varnish. Too much varnish improperly distributed will cause the surface to sag. The remedy, when surfaces are so impaired is to allow proper hardening of the film, after which they should be rubbed down with fine glass-paper and the irregularities of surface removed. They must be re-varnished under better conditions and greater care exercised. Many defects in varnished surfaces can arise from badly prepared grounds.

WAX POLISHING

Many timbers have decorative qualities so delightful that methods of finish have been devised so that their natural beauties can be displayed. These decorative finishes provide the films required to make them serviceable and render them clean. Such films must be of a transparent or semi-transparent nature, to allow the qualities of grain to be displayed.

Soft woods, such as pine, deal, bass and American white-woods, are frequently stained. Oil, water or spirit stains are used for the purpose, and afterwards a protective film of varnish

is applied. The stains used for the purpose can be prepared by the decorator himself, or he can choose from a large variety of manufactured goods.

The wood before being stained must be free from any trace of grease, oil or dirt. The surface must be sound and free from scratches or knots.

The absorption quality should be reasonably equal, but unfortunately some of the soft woods are particularly sappy, and often badly seasoned. In the latter case, one notices light grey blue markings in the grain, and these absorb the stain to such an extent that those portions would be almost black. The decorator when dealing with wood which he suspects to be unequal in absorption should apply a preliminary coat of size, or, in not very severe cases, a solution of methylated spirit and white knotting. (Staining is most satisfactory when the colour can be incorporated directly with the surface, and therefore when possible direct application is best.)

Water stains can be prepared quite simply, but the excellent qualities of many manufactured products make such preparation hardly necessary. The stain can be produced from pigments and a binder. Aniline dyes are most satisfactory. These must be soluble in water, and the principle colours suitable for the purpose are turmeric, logwood-chips, red sandalwood, madder, nut glass, indigo and anatta. There are three or four suitable binders—beer (old or stale ale) which should be used half-strength; vinegar, which is generally most satisfactory and can be used undiluted, and liquid ammonia.

Stains

Oil stains can be prepared by using pigments ground in oil, the stain being thinned out by the use of turpentine or white spirit. A certain number of the earth pigments can be used in oil stains, but these must be free from any white base. Among those suitable for this purpose are vandyke brown, burnt and raw sienna, burnt and raw umber, yellow ochre and blue-black. (These pigments when ground in water can be used for water stains.)

When preparing oil stains, the addition of a small quantity of japan gold size will greatly accelerate the drying quality of the stain. When considerable quantities of stain are required for

staining floors and so forth, the range and intensity of the colour is controlled by the amount of thinnings used, and can be produced from black japan with the addition of turpentine or white spirit. No oil should be introduced into this mixture, and the stain will work well if evenly distributed over the surface. The work can be finished by applying a coat of size to prevent absorption of the varnish, which should be of a hard drying quality. Special polishing varnishes are produced, which when thoroughly dry and hard have their surfaces cut down with pumice powder and a damp pad. The rubbing down must be carried on until a comparatively flat or glossless surface is produced. It should be polished afterwards by powdered rotten stone, and sweet oil should be applied with a piece of fairly thin felt. Considerable labour is required to produce a good result, which is extremely durable when completed, and has a fine polish. This particular stain can be finished in the usual way with wax directly it is dry.

All wax finishes produce excellent results, assuming that the polisher has expended sufficient time and energy on the job. A stained work can be finished by applying a suitable coat of varnish, which should be well spread. The varnish may be matt surface or polished, according to the choice of varnish made. With water stains, fine transparency is possible, and this gives the colour a charm of its own, but their application tends to raise the grain slightly.

Soft woods are most suitable for finishing with stains; hard woods are more frequently polished. Prepared stains are marketed by the name of a particular wood, but at present the variety of colourings for choice vary, and the tone of the particular wood imitated is not necessarily true.

In these prepared stains, oak may range from warm oak to "antique." Black, mahogany, walnut, satinwood, maple and ebony also vary in tonal imitations. Oil stains allow of more manipulation. The grain may be emphasized, if, after the stain has been applied and given sufficient time to penetrate the wood, certain more slowly-drying portions are wiped with an absorbent cloth. Varnish stains are prepared from hard spirit varnishes which are sufficiently modified to be applied with a brush used with just sufficient colour to stain the varnish. They are not generally as satisfactory to use as staining properly executed with

oil or water stains. Brunswick black can be employed when staining floors if they are to be wax polished afterwards. Solignum, prepared in varied colours, will successfully accomplish the same task, and may also be wax polished. Solignum has the additional value of being a first-class preservative for timber.

To secure a good job it may be necessary to do a certain amount of stopping; nail holes must be treated in this way. This can be done with plaster of Paris, but there are also proprietary stoppings manufactured for the purpose. When using plaster of Paris for stopping, it should be prepared and previously stained before using, otherwise it will take up too much of the stain. With cracks in floorboards, greater success is achieved with a more pliable substance. Paper pulped up with glue size and whiting will be found efficient, and if it is too obvious, the surface should be covered with dry pigment of the same tone.

As already indicated, some woods have natural qualities which are reasonably decorative in their natural state, while others by judicious staining have sufficient character to be pleasing with little or no gloss. A gloss finish, produced by a suitable varnish, will emphasize the figure and grain of a wood, while also affording protection to the surface. Where varnish is desirable, the surface of the wood can be built up by a number of coats of quick drying varnish, and when dry rubbed down with waterproof glass-paper or with pumice powder. By working across the grain the gloss can be removed. Afterwards two thin coats of a good slow-drying varnish will give a splendid surface.

Wax finishes

These are used where the surface is to be polished but does not require to have that excessive reflecting quality which varnish possesses. Wax polish in its oldest form is a preparation obtained by dissolving beeswax in turpentine. The polish is one which gains in beauty by each successive polishing. The wax should be used sparingly, and the actual polish produced by rubbing the wood with a soft cloth until the surface exhibits no trace whatever of the sticky quality of the wax. The polish should not be applied too frequently.

Where new wood is being treated it is essential that it should be sound and clean. In cases where wood has been previously polished, warm water and very little soap will ensure the surface

being ready to be polished again. With panelling and large surfaces it is helpful to rub the surface over with a little turpentine on a soft cloth. This removes the dirt and any surplus wax polish. Though there are quite a number of excellent prepared wax polishes on the market, the writer retains his faith in the old form of wax polish. This can be prepared quite easily from white beeswax which should be shredded up and then dissolved in turpentine. The mixture should be left covered for 24 hours, by the end of which time it will be found completely dissolved. If desired, the wax can be heated separately by using a double saucepan, and then added to the turpentine. It should be used not as a paste but as a loosely flowing liquid. In public buildings and museums, where fine panelling and furniture has to be cared for, this solution is normally used. It is brushed on lightly, left for some hours and well brushed off; the polishing is done subsequently.

In the treatment of hardwood floors, a wax finish is the most desirable. If they have been properly prepared by scraping and stopping, so that the surface is smooth, they can be stained to the required tint and wax finished.

Varnish finishes may be applied to both hard and soft woods. Two or three coats of hard drying varnish are first applied to the wood to act as a stopping, and then the surface of the wood is built up.

As much time as possible must be allowed to ensure that the varnish is really hard and dry. The next stage is to remove the whole of the gloss; this is done by using a waterproof abrasive paper, worked across the grain. Finely powdered pumice powder will also produce the desired effect. The surface must present an entirely matt quality before the polishing is begun. The final process requires both patience and energy. It is achieved by the use of powdered rotten-stone lubricated with sweet oil and applied by using a pad of soft felt. When this is complete, the surplus oil is removed with pea-flour, applied with the palm of the hand. Two thin coats of a slow-drying varnish are sometimes used when it is not expedient to finish by polishing. When patent fillers are used, they are apt to evaporate and dry quickly. In this event, the use of abrasive paper worked against the grain will remedy the defect and give the desired surface.

RECIPES FOR STAINS

Oak

Warm in tone:	Burnt umber; vandyke brown.
Cool in tone:	Raw umber; raw umber and blue.
Grey:	Raw umber and black; blue-black.
Grey or Weathered:	Blue black and aluminium.
Antique:	Burnt umber and blue black.
Green:	Prussian blue and ochre, prussian blue and raw sienna.
Black:	Blue black and burnt umber; vandyke brown and black.

Mahogany

Light:	Burnt sienna; burnt sienna and black.
Old:	Vandyke brown and blue-black.
Rich:	Mahogany lake and vandyke brown; Crimson lake and blue-black.
Brown:	Burnt umber and mahogany lake.

Walnut

Ordinary, Warm:	Burnt umber alone: vandyke brown.
Ordinary, Cool:	Raw umber alone; vandyke brown and blue-black.
Yellow tone:	Raw umber and raw sienna; vandyke brown and yellow ochre.

Satinwood

Bright tone:	Raw sienna alone.
Quiet tone:	Raw sienna and vandyke brown.

Maple

Quiet:	Vandyke brown (only a wash).
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Ebony

Dull:	Ivory black.
Brighter tone:	Black Japan.

All oil stains are best applied thinly and brought up to the full strength required by giving further coats. If it is desired to imitate the quality and tone of a particular wood, the preceding trade recipes will prove useful. These will be best made up

from decorators' oil colours which are procurable in half pound tubes ground in oil. Do not attempt to make the stain in bulk until you have experimented with a palette knife on a piece of glass to find out approximately the proportion of each colour needed to obtain the tone you require.

Experimenting will enable you to appreciate the staining qualities of the individual colours and prevent waste. Afterwards you can mix the bulk of the colour by working to the same proportion. When quantities are to be prepared, colours procurable in pound tins and known as "stainers" should be used. Each colour should be tried out upon a piece of wood similar to that which you are about to stain.

CHAPTER XXIX

DISTEMPER

Size-bound distemper

The principal pigment of size-bound distemper is whiting of the best quality. It is known as "gilders' whiting," and is clean and free from undesirable matter. It can be purchased in cakes or balls, and when mixed with water it possesses a good covering quality, though its opacity is indifferent if mixed with oil. The whiting is bound, or held together, with size, a gelatinous substance which is soluble in water, and is consequently subject to the humidity of the atmosphere. It may be used upon surfaces of plaster, stone, brick, or stucco, but it is unsuitable for application to wood.

The durability of distemper has definite limitations. Under damp and unfavourable conditions it has a short life. The best use for it is on ceilings and the upper parts of walls, where it is out of reach and not easily soiled. If soiled or damaged it cannot be satisfactorily cleaned.

To prepare size-bound distemper

To prepare size-bound distemper, break the whiting into small pieces about the size of an egg; place these in a pail about two-thirds full of water, and leave them to soak. Obtain some ordinary jelly size, break it into small pieces, add a little warm water, and heat the mixture until it liquefies. It must not be boiled as overheating causes deterioration. The proper consistency will set into a fairly firm jelly. Without disturbing the whiting. Pour off the surplus water, and using a flat stick, beat the mixture into a claylike consistency. If the final mixture is to be tinted the colour should now be added. The powdered colour must be mixed to a stiff paste with water and then beaten up with the whiting. When it is thoroughly mixed, take a sample, which should be dried in order to test the tint. (It will of course be lighter when dried.) Add the colour a little at a time as this will facilitate the control of the final tint. When the colour has

been added put in the size and thoroughly mix. Care must be taken that the distemper when finally ready for use is of good consistency. If it needs dilution when working, take care in adding any extra water not to add too much as faults are usually the result of over-dilution. Before using, strain the mixture through a piece of fine scrim. This will help the consistency of the mixture, and thoroughly co-ordinate the colour and the size. Properly made, this mixture will be equal if not superior to the finest ready-made product. The following colours are all suitable for making tinted distemper:—

Lime blue	Ultramarine	Azure blue
Raw umber	Burnt umber	Blue black
Raw sienna	Burnt sienna	French ochre
Italian ochre	Pulp chromes	Imperial yellow
Mineral greens	Lime greens	Lakes pulp
Indian red	Venetian red	Rose pink

These normally can be obtained in powder form. They should be well ground and carefully mixed.

Clearcole

Clearcole is a preparation sometimes used for the treatment of new walls to stop absorption. This makes it possible to apply the distemper more freely. Clearcole can be prepared by adding three quarters of a pint of finishing distemper to one gallon of jelly size. It can be applied freely; under satisfactory conditions it dries rapidly.

Preparation of surfaces

New walls present little difficulty, and an examination of ceiling or walls will soon reveal whether the surfaces are sound. Where work has previously been distempered, all the old material down to the plaster base should be removed before applying a fresh coat. Unless this operation is carefully carried out, the new distemper will soften the old material and cause it to pull away, giving a disappointing and irregular finish. In no circumstances should distemper be applied over a previous coat of the same material.

It is usually a simple process to remove the old material. It readily yields if soaked first with clean, preferably warm, water.

It can then be scrubbed off with the help of an old stock brush, and finally sponged clean with fresh water. To do the work comfortably and efficiently a scaffolding is advisable. Two pairs of steps and a board are fixed so that a complete area can be attempted at one time. Well soak the surface and use the side of the brush with a scrubbing movement. Afterwards the surface can be cleaned and freed of the old material with the help of a sponge and plenty of clear water.

If any parts do not yield to this treatment they should be scraped, using a painter's broad knife and avoiding damage to the plaster. Cornices and ornamental details will require extra care in order to free their relief of any excess of material. This part of the work will be rendered simpler if the surfaces are soaked two or three times before attempting to scrub them clean.

Repairing

Cracks or bad surfaces should now be made good. Examine the ceiling for any loose parts. If any exist, they should be taken down and the laths surveyed for defects. These are remedied by the use of fresh material.

Where the surface is stained or deterioration of the surface of the plaster has occurred, leading to irregular absorption, it is advisable to apply a white lining paper over the whole of the ceiling, making the surface more even and uniform. A thin coat of knotting to the paper will seal the surface and leave it non-absorbent. Thin clearcole is suitable.

Stains in plaster work are usually the result of some structural defect. The application of a thin coat of flat white paint to the whole area is sometimes advisable. This seals the surface, and makes a satisfactory and at any rate superficially sound job where ordinary conditions render other treatment difficult.

The application of distemper

The preparation of the surface has been dealt with fully. In new work the work involved should be negligible. A clean, sound surface, free from dirt or stains, should be ensured; any blobs of material that may have adhered to the surface during building operations removed by lightly rubbing down, care being taken not to injure the surface of the wall. New plaster work should first have a coat of clearcole to check the absorption,

which will otherwise upset the balance of moisture on the material. Clearcole is easily put on, and under normal conditions dries rapidly. After this, distemper will be found to work with ease and freedom.

It must be remembered that edges have to be joined before they are dry, and for that reason the operative will be well advised to work quickly.

Brushes recommended are an 8-oz. distemper brush, and a flat brush about 6 inches wide, both of good quality. If new, the brushes should be well soaked over-night before use, but must be free from water when brought into use.

The detailed sequence of operations depends upon the proportion of the room; it is usual to work away from the light. Slightly charge the brush and, holding it sideways, carefully cut in the edge of the work. When the edge has been completed for the width of the shift you are doing, continue with the brush flat for a full width with each stroke. The distemper must be laid on freely and not worked out as in ordinary painting. No portion should be touched up. Proceed with each new stroke finishing with the wet edge of the preceding one. Your successive shifts must be made with the speed necessary to join your edges successfully before they are dry. In the case of a large ceiling, a second operative will save a certain amount of anxiety in this respect and ensure a good uniform coat.

Distemper in decoration

To the writer distemper suggests the finishing coat for large flat surfaces. It possesses certain qualities of texture which, owing to their unique reciprocation to light values, contribute to decoration a very satisfying "matt" quality. The aesthetic value is independent of any further enrichment, and while it is possible within limits to elaborate, it is well to consider the value of a simple background in stimulating the contrast between fixtures and furnishings and furniture. In any well-considered scheme contrast must always be the dominating principle. Where surfaces conform to a traditional period, carrying ornamental enrichments and mouldings, or to a more modern treatment with embellishment in the nature of relief work, these enrichments may supply the motive for superimposed colour treatment. Such instances occur where mouldings and low relief ornament

constitute the cornice, or where panels have been introduced to stimulate or correct the general proportions of the room. Even so, the liability of distemper to suffer damage under unfavourable conditions may lead to doubts as to the permanency of the work, or the wisdom of executing it in so friable a material.

Stencil work can be applied to distempered surfaces, but the variation in the finished textures of the two processes is not really sympathetic. Decoration of a direct nature by the application of freely-drawn direct brush-work ornament of simple type is better than stencilled work. The lines of mouldings may be picked out in other colours; the backgrounds of any relief can receive treatment, or the actual ornament itself may be coloured provided that proper consideration is given to the general harmony of the colour scheme.

It has already been explained that distemper cannot be satisfactorily placed over itself. Hence, it follows that if any elaboration is to be attempted, the portions of the work which are to be elaborated must be left until the larger surfaces have been completed. Then, with the help of smaller brushes, sash tools, or fitches, the additional tints may be added. Should the borders of any particular colours be exceeded they must be wiped clean to the edge.

The setting out of guide lines can be done by using a thin piece of soft string or cotton. It should be well chalked with a colour easily seen upon the background. Both ends of the marked string must be fixed firmly, and then jerked from the centre so that it springs back and marks the wall. The width of such lines will determine if they can be run in one stroke or whether they will need to be filled in afterwards. A lining or angle fitch is the most suitable for this work; a correct manipulation of the angle of the brush will enable the centre of wide lines to be filled in after the outer edges of the line have been run. When lines or stencilling are to be attempted, the scheme is better executed if worked in a matt-surface paint bound with japanese gold size, sufficiently thin to work easily. Care, however, must be taken to see that the gold size is only sufficient to enable the paint to work, as an excess would leave a stain at the edges of the work. As an alternative to this medium, ordinary distemper thinned out with gum water may be used if precautions are taken to make it sufficiently thin to draw freely. If the work is of great

importance, finer effects can be produced by using tempera colours of a reputable make, but these are very expensive and their cost normally makes them prohibitive.

Washable distemper and water paint

This material has certain advantages over the ordinary size-bound distemper; instead of being soluble in water, it possesses a limited resistance to that liquid. It is usually described as "oil-bound." A number of makes are marketed, and any well-known brand is reliable. The actual composition of any such brand is a proprietary formula, and may vary slightly in the different named varieties, but instructions for use are provided by the manufacturers and must, of course, be carefully observed.

Though oil-bound distempers are described as "washable," the result of washing will depend upon the operation being carefully and intelligently carried out. Such resistance to water as there is results from the nature of the substance used for binding the material. The oldest formula for this purpose was egg and vinegar, but more modern methods have procured substances both effective and sufficiently economical for commercial use. Casein (a derivative from milk), alum, soap or oil may be used when a hard insoluble surface is required. Satisfactory brands include "Duresco," "Walpamur," Hall's Water Paint, Harland's and the necessary petrifying liquid. With the modification by stainers where needed, these cover a wide range.

Applying washable distemper

Some brands are supplied complete in themselves, others require the addition of petrifying liquid. Where this is necessary, instructions for its use are printed upon the container. Two qualities of these goods are supplied by retailers, one for external the other for internal decoration.

The surface before painting must receive, as with all other materials, proper attention. If distemper of the same type has been previously used, it will require to be washed with water and scrubbed down with an old stock brush to remove grease, dirt, or any substance other than washable distemper. But should the surface have been covered with size-bound distemper, it must be tackled by scrubbing. All traces down to the plaster

base must be removed. Where scrubbing is not drastic enough, scrape with a painter's broad knife. In specially obstinate cases a coat of thin sharp lead paint, three parts turpentine to one part of oil, must be applied. This will incorporate the old material and render the surface suitable to receive the new distemper if repairs to the plaster surface have first been attended to.

Where the wall surface has received extensive repairs, it is advisable to apply a stout lining paper over the whole of the wall: this will assure that the colour dries evenly in the finished work. Do not attempt to lay off in any one direction, but cover the surface lightly. Skill combined with good taste will provide almost unlimited opportunities for enlarging the scope of the decorative qualities of distemper.

By mixing two or more the range of standard tints can be greatly enlarged. If, however, the exact colour desired cannot be achieved by this method, it may be suitably adjusted by the use of pure stainers ground in water. The texture itself can be perfected by the skilful use of a stippler when laying on the paint. The stippler is a square brush, and it must be of good quality. A suitable type is made from white hog bristles. After the distemper has been applied freely, the brush, used with light springy touches, will produce an even surface free from brush marks.

Walls requiring panel treatments should receive a coat of colour over the whole surface after the panels have been produced by framing them out with an anaglypta moulding. They may be treated by the introduction of a flat surface of a different colour, or alternatively a broken effect can be produced if after the background colour has dried a second colour is broken into the background. The second colour is applied by lightly dabbing over the surface, a coarse sponge being used. There are other ways in which the modification of flat surfaces can be produced, varying with the skill and taste of the operator.

Variations of texture

The addition of fine plaster of Paris to a reliable brand of water paint will give a plastic quality to the material which will enable the decorator to enlarge further the field of texture. So far as the amateur is concerned, sheer practice, backed by enthusiasm, is essential before satisfactory results are possible.

Remember that reticence and simplicity should always control mechanical skill when decorating.

Water paint intended for relief work must be applied with a brush, hence its consistency should be such that it can be manipulated with this tool.

Do not attempt to mould the relief too high, and because large surfaces are difficult to manipulate, the work should be planned to afford comfortable scope in working. There is a tendency for the adhesive value of the material to deteriorate, and it is advisable to give the work a thin coat of white lead paint (lead, oil and turpentine in equal parts), which will equalize the absorption and ensure better results. Where the plaster work is new it must be quite dry before texturing can be attempted. The texture can be produced to conform to the tool used and to its manipulation. Where the paint is thin an ordinary stipple lightly applied will give a pleasant texture. If stippled with a damp sponge, the result will depend upon whether the sponge is close or open and whether its application to the surface is heavy or light. By dabbing the wet textured surface with a wad of wet fabric the finished work may be further varied according to the material used. Roller combs and even brush work can add yet another quality of texture to plastic paint.

Water-paint distempers. Faults and hints

New plaster requires atmospheric action to assist in the maturing of the substance, and the alkaline salts present in new work are injurious to almost any form of decoration whilst the plaster is in an active state. The most satisfactory decoration for a newly plastered surface can be obtained by the application of a reliable brand of water paint. New walls require to "breathe," any substance which seals the pores of the plaster interferes with the proper drying of the material. Distemper is particularly suitable because it allows free drying. Any efflorescing salts which pass through the distemper may be dusted off without injury to the surface.

The consistency of distemper

During cold weather the material will become stiff and almost cheeselike, but a spell of hot weather will render it quite thin. Petrifying liquid should always be used according to the maker's

instructions. In hot weather it may be added to the material overnight, and the container immersed in cold water until required for use.

When white distemper is required

Three variations of the best brands are prepared, they are called "Off white," "Broken white" and "Snow white."

Modifying distemper tints

Any adjustment required in distemper tints can easily be made. Stainers ground in water are specially prepared by the manufacturers for this purpose.

Distempered surfaces not solid in colour

Most distempers are extremely opaque in colour and body. To obtain these qualities the manufacturers select those pigments which possess good opacity, but there are a few colours produced which have not this quality. Scarlet, carmine and deep blues are usually omitted, although generally speaking they are permanent to light. A sound coat of white, tinted with the required colour, is applied first where colours that lack body and opacity are being used, although it is not normal to use an undercoating for distempered work. When this tinted under-coat is thoroughly dry the final coat is painted over it.

Stained ceilings

A coat of white water paint applied over discoloured or stained ceilings gives the best results. Before this treatment is undertaken all traces of distemper must be washed off, a course advisable for walls in a bad condition. When these are difficult to wash, a coat of flat leadless paint put on before the distemper is the best preparation. A coat of this flat leadless paint is always useful whenever surfaces previously distempered are suspect, or when difficulties arise in their cleaning.

Oil-bound distempered surfaces to be redecorated

If these are in a fair condition it is only necessary to remove the dirt and grease from the surface before proceeding, but if the surface is very porous it must be prepared by the application of a coat of silicate petrifying liquid. This is made by the addition of

one lb. of water paint to every gallon of the liquid. All holes, cracks and plaster defects must be made good by using equal proportions of water paint and plaster of Paris.

Plaster surfaces

After alterations are completed, it is sometimes necessary to decorate surfaces in which new and old work are mixed. The complete surface should be cleaned after which it is necessary to bring both surfaces into a uniform state. If the old work has been painted, the new work should be painted to match the old before distemper is painted over the whole.

Petrifying liquid

Water paints usually require one gallon of petrifying liquid to each 56 lbs. of paint, but the condition of the surface will at times require this to be varied. Dry patent plasters usually require more than this specified quantity. When unequal patches of colour appear in a distempered surface they are the result of unequal porosity. To remedy this they should be carefully touched in; when perfectly dry a further coat should be given.

When quality rather than economy is the chief consideration, a surface should receive three applications, and any bad patches touched up before the second coat put on. The time allowed for drying in each operation should be as long as possible. The final coat should contain more thinners and be stippled on.

Gummy "tears" on water-paint surfaces

Dark-coloured "tears" occasionally develop on distemper, resulting from an excess of petrifying liquid in the final coat. They are removed by using a sponge and warm water, and giving efficient ventilation when drying the surface.

Washing water-paint surfaces

The surface of water paint continues to harden, attaining its maximum hardness 12 months after application. With fair wear there should be little need to clean the surface, but should cleaning be necessary it must be done with care. Water paint will not stand scrubbing with hard brushes. Finger marks can be removed by wiping the surface gently. For the cleansing of larger surfaces commence at the bottom and work upward. It

is advisable to leave the washed surface wet and not to wipe it off. A good quality soap powder may be used, in the proportion of $\frac{1}{2}$ lb. to a bucket of water. Each portion should be well rinsed down as soon as it has been washed and before proceeding to the next portion.

Crumbling surfaces

Petrifying solution gives the most satisfactory treatment for crumbling surfaces in brick, stone, cement or stucco. They should be thoroughly soaked with the solution, and when dry they become perfectly solid again. It should not be applied during frosty weather, and is best used after a dry spell. Two or more coats may be required, with an interval of 24 hours between each coat. When the solution begins to run down the surface with a milk-like consistency it is an indication that sufficient liquid has been applied.

Before using the solution the surface to be covered should be well brushed down, wire brushes being most suitable for this purpose.

The treatment renders surfaces impervious to moisture and is generally permanent.

Treatment of stonework

Water paint is excellent for preserving stone and allows the material to retain its natural texture. A coat of petrifying liquid should be first applied followed by a coat of stone "Duresco" 47. If the surface is decayed or requires repair, a cement mastic and boiled oil should be applied. The boiled oil is applied first and the cement afterwards.

Water paint applied over old paint

If the paint is in good condition it forms an excellent under-coating. To give sufficient key to the water paint the old surface should be washed down with water to which washing soda has been added in the proportion of one oz. to the gallon.

To remove splashes from water paint

Water paint sets extremely hard, and therefore all splashes should be removed before they set. They will harden in a few minutes if they are not wiped off with a wet sponge. Should

any splashes set and become hard before you can give them any attention, they can be removed by an application of hot vinegar, which softens the binder.

Varnishing water paint

When thoroughly dry, water paint can be varnished. To preserve the tint of the material two thin coats of jelly size should be given before the varnish is applied.

Water paint as a filler for plaster

A good quality water paint produces an excellent filler for plaster surfaces. It should be used in equal proportions with Keen's cement or plaster of Paris. As a stopping it will neither crack nor shrink, and it is equally valuable for filling woodwork.

CHAPTER XXX

WALL-PAPER

The successful selection of any wall-paper depends upon sensitive judgment, careful consideration, and knowledge of principles governing interior decoration.

Three principal types of paper are obtainable—machine-printed, hand-printed, or stencilled. Hand-printed or stencilled papers are, however, excluded from general use owing to their high cost. Machine-printed papers of good quality provide a first-class finish, as well as being aesthetically satisfying. A number of them have textures which offer considerable advantages where masses of colour are desired. “Satins” and “Soirettes” have in their production the use of mica powder, giving them a delightful sheen. Embossed papers are made in many varieties, they include imitations of canvas and various other fabrics. Leatherettes are more heavily embossed and are used to imitate that material. There are also imitations of various woods used as panelling. Anaglypta or Lyncrusta Walton are too well known to need discussing.

A roll of wall-paper of English manufacture should measure 12 yd. by 21 in., and this usually supplies three lengths for a room of average height. A roll of American paper will vary from $7\frac{1}{2}$ to 8 yd., with a width of 28 in. French wall-papers are only 9 yd. long and 18 in. wide. These facts should be considered when purchasing stocks, as most English firms stock American and French papers.

Papers of a cheaper character are known as “pulp.” They have a pattern printed direct on to a plain paper. The next class includes “blotches,” or those which have a printed background, the background and the pattern being printed in one operation. In more expensive papers, known as surface printed, the backgrounds are specially prepared before the pattern is printed, the latter being afterwards superimposed. The pattern is printed from wooden rollers, a separate roller being required for each colour. The machines can deal with colour-schemes requiring as many as 20 rollers, allowing for a very wide scope in production.

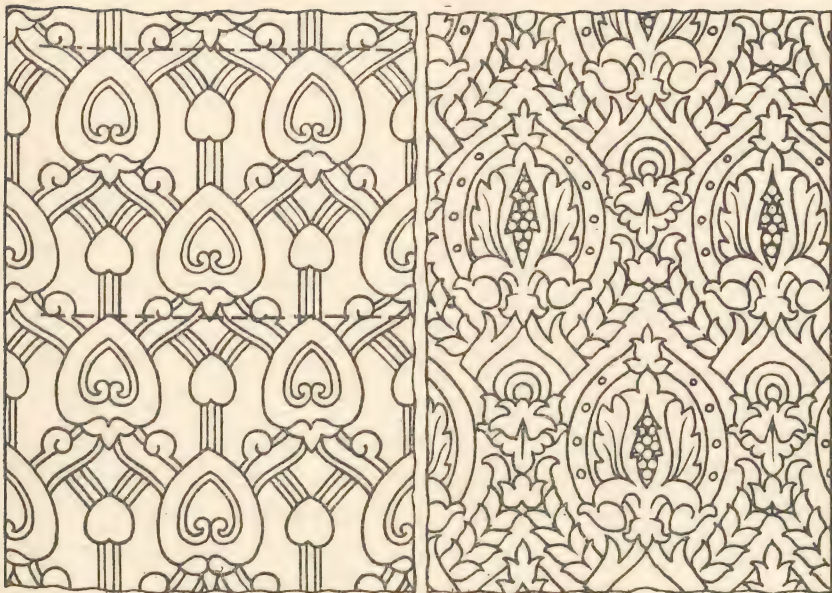
“Sanitary” papers are produced from copper rollers on which

the pattern has been engraved. Colour variations and modifications of tone result from the ordinary technique of the engraving process. They are printed with oil colour, made permanent by the use of a fixing medium composed of turpentine and rosin. They are impervious to moisture, and may be purchased ready varnished, or they can be varnished in actual position. They are invaluable where damp or moisture would destroy an ordinary type of paper.

Many patterns are specially designed for nurseries. These papers are impervious to moisture, practically indestructible, and can be cleansed with soap and water, or washed over with a suitable disinfectant.

Wherever wall-paper is involved a proper conception of the finished scheme is essential. Scale and proportion must receive attention, and no jarring note allowed to destroy an effect of unity and completeness. Here a word of warning must be given concerning small pattern books. These cannot fully convey suitability or otherwise of the papers represented, though they are useful as an index to colour ranges, and may serve to prompt the imagination. Papers should be finally selected in the manufacturer's or dealer's showroom, where they can be seen at full length and under the best conditions. It must never be forgotten that they are intended as backgrounds for individual furniture and possessions. Wherever feasible, make your final decision with a full roll of the selected paper pinned to the wall in actual position in which it is intended to be used. Paintwork, furniture, hangings and lighting all play important parts in any successful scheme of interior decoration.

The number of pieces required should be estimated carefully to avoid waste. As batches of paper are apt to vary in different printings, the rolls should be examined to ensure that the colour is satisfactory and no irregularities exist. This makes it essential that no shortage should occur, as an odd piece or two might have the disadvantage of colour irregularity, and the fact be unnoticed until the major part of the material has been hung. Examine the "repeat" of the pattern, as some papers require far more matching space than others. Some patterns are arranged to repeat side by side horizontally. These, provided the actual pattern has no large or awkward features to create waste in cutting, present no particular difficulties when estimating. Other patterns, however,



Side by side repeat

FIG. 1

Drop repeat

known as "drops," are arranged so that the repeat drops one-third to one-half. In such cases matching may not be so economical, though usually waste can be avoided by cutting successive lengths, using two rolls of paper and alternating one length with the other.

Measurements and calculations

Feet Run Including Doors and Windows			Height in Feet from Cornice to Skirting								
			7½	8	8½	9	9½	10	10½	11	11½
28	..	..	4	4	4	4	4	5	5	5	5
32	..	..	4	4	5	5	5	5	5	6	6
36	..	..	5	5	5	5	6	6	6	7	7
40	..	..	5	5	6	6	6	7	7	7	8
44	..	..	6	6	6	7	7	7	8	8	8
48	..	..	6	6	7	7	7	8	8	9	9
52	..	..	7	7	7	8	8	9	9	9	10
56	..	..	7	8	8	8	9	9	10	10	10
60	..	..	8	8	8	9	9	10	10	11	11
64	..	..	8	9	9	9	10	10	11	11	12
68	..	..	9	9	9	10	10	11	12	12	13
72	..	..	9	10	10	11	11	12	12	13	13
76	..	..	9	10	10	11	12	12	13	13	14
80	..	..	10	11	11	12	12	13	14	14	15

This table, which can be used to estimate the number of rolls required for an ordinary room, is based upon the British standard roll, which is approximately 12 yd. per piece and 21 in. wide exclusive of selvedge.

The estimate is reached by taking the complete superficial area of the room, including doors and windows, and dividing it by the width of the paper. This will give you the number of lengths required for the job. The height of the room supplies the individual lengths, which, divided into the full length of the roll of paper, will indicate the number of lengths that can be cut from the roll. It is then a simple matter to estimate the total number of rolls required. Another method, used by craftsmen in the trade and which works out quite efficiently, is to take the roll of paper and measure the number of times it goes round the room width-wise, ignoring window and door openings, since they will need only small pieces, and these can usually be supplied from what is left over after cutting.

Having found the number of lengths required, apply the following ready reckoner, which can be easily memorized :—

For lengths 8 ft. 9 in. to 9 ft. 6 in. a roll of paper will cut 3 lengths.

For lengths 7 ft. 9 in. to 8 ft. 6 in. a roll of paper will cut 4 lengths.

For lengths 5 ft. 9 in. to 6 ft. 9 in. a roll of paper will cut 5 lengths.

Assuming that you are already aware of the number of lengths required, your estimate will be the number of rolls which supplies the requisite quantity of pieces to fit the height of your wall.

Any estimate must be based upon the character of the individual paper; lining papers, plain or semi-plain papers, and those which have small patterns present no difficulties. Patterned papers with large units, or those which require to be centred, tend to cause more work in matching.

Tools and equipment

Appropriate tools make for efficiency, whatever the job, and minimize mistakes and difficulties. The craftsman employs tools and experience: it is the combination of both that contributes toward his ultimate success.

The equipment need not be really extensive, and might be

divided into two groups—those which are desirable and useful, and those which are indispensable.

A pail for your paste, a flat 6-inch distemper brush with which you will use the paste, are obviously indispensable. You will also require a sponge to remove surplus paste. A 2-foot rule, a metal straight edge to use when cutting, and a good pair of well-sharpened pointed scissors are necessary for cutting, measuring, trimming, etc. A Morgan Lee pocket trimmer is also useful. A “plumb bob” and line—in less technical language a small weight attached to a length of twine—will be needed for obtaining vertical lines upon the walls when hanging paper.

There are two kinds of brushes used in hanging wall-paper, a heavy one and a thinner kind which is very handy for beating the paper into the angles of the walls. Several kinds of rollers are made. A 6-inch roller covered with felt does the general work, and the 1-inch boxwood roller will assist to make a good sound job of the joins or seams.

There is also a small angle roller of boxwood specially designed to enable paper to be manipulated successfully at the angles of the room. A cutting wheel acting as a knife can be used so that paper may be cut and fitted on the wall while the paste is still wet.

The pasting can be done on the table not less than 6 feet long and 22 inches wide. A pair of steps which will allow you to reach any part of the wall is also necessary.

The sequence in which the operations are to be followed should

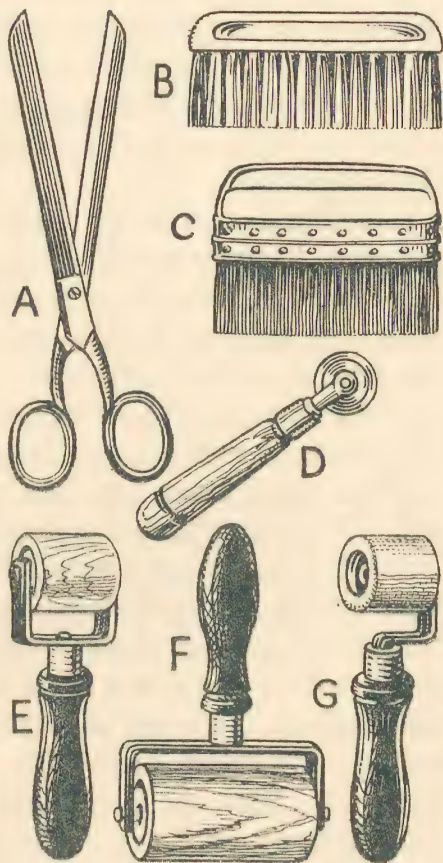


FIG. 2

- | | |
|--------------------------------|-----------------|
| A. Scissors | |
| B and C. Smoothing-out brushes | |
| D. Corner knife | F. Roller |
| E. Flat seam roller | G. Angle Roller |

be carefully worked out beforehand. Experience has taught the craftsman that it is advisable to work away from the light; hence the principal window of the room should be the starting point. All wall-paper seams should be butted at the joints to prevent ridge shadows.

Having made a start at the selected window, the decorator will hang the lengths in succession, left and right, working round to the corners farthest from the light—the least conspicuous part of the room. Where plain, semi-plain, or small patterned papers are being used, this part of the work is usually simple and straightforward.

A modification of the plan may be required when the design of the paper includes any dominant and important unit. In such a case each wall must be dealt with separately. To preserve the value and unity of the pattern it will be necessary to centre the pattern on each blank wall. Before the first length is hung a vertical line should be struck on the wall. The position of the line can be determined by taking a roll of paper and marking its exact width away from the window about half way up the wall. Now the plumb line must be securely fixed at the top of the wall with the line passing through the mark already made. After having first well chalked the line with a coloured chalk, bring the plumb bob to rest at the bottom of the wall. This will give a vertical line which is the width of your paper away from the window. To strike the line upon the wall hold the plumb bob securely below, keeping the line thoroughly taut with your left hand. With the first finger and thumb of the right hand draw the line towards you and then allow it to spring back sharply to the wall. To this line fit the vertical edge of your first length.

It is important that the first and all other lengths should be hung vertically, otherwise the ceiling line would be affected. A good craftsman will test the second length in this way, and where a long flank has to be papered will occasionally test from time to time to ensure that no irregularity occurs.

Trimming, cutting and pasting

A flour paste is always satisfactory and can be easily made. The quantity used is $3\frac{1}{2}$ lbs. of flour mixed with cold water sufficient only to produce a smooth batter. When this is completed, one gallon of cold water should be stirred in carefully and

the flour cooked sufficiently to form it into a strong paste. The working consistency can be adjusted to suit the weight of the paper, heavy papers require a stiffer paste than light ones. Should it require to be thinned, the paste can be diluted with cold water. The paste must be quite fresh and should be prepared the day before it is required. As an alternative to flour paste cold-water paste of a good proprietary brand may be used. For Lincrusta and heavy papers of that nature, "Dextrine" should be used. This should be mixed 12 hours before it is required for use, and should be applied in a stiff condition.

Before being pasted the paper will need to have the selvedge edges trimmed. This can be done with scissors, providing care is exercised to prevent damage to the pattern; small mechanical trimmers such as the Morgan Lee may also be used. Retailers usually own a trimming machine and will do the work for you at a small cost.

The ceiling line

Where the pattern commences at the top of the wall, the pattern should be chosen with especial care. (In non-patterned papers no such consideration is, of course, required.) By experimenting with a loose roll of paper it is a simple matter to discover the point in the pattern which, in your judgment, supplies the most satisfactory ceiling line.

Cutting the lengths

In order to cut the lengths of paper place the roll with the pattern face upwards at the right-hand end of the table, and unroll it sufficiently toward the left so that the exact portion of the pattern selected for the ceiling line is exposed to view. At this point cut straight across the roll, as near as possible to the end of the roll to avoid waste. Your measurements will be made from this line.

Pass your rule up the paper until you reach the required measurement, then continue beyond it until the position of the next ceiling line is reached. Do not cut here, but add three extra inches to allow for trimming when the paper is being hung. (The same allowance must be made eventually at the other end.) From this point measure the length. If, for example, the length you require is 7 ft. 6 in., you must measure back 8 ft. to

your starting point (7 ft. 6 in. plus 3 in. at the top and the bottom). Cut this length and similarly the other lengths required. (*See p. 78 for Preparation of Surfaces.*)

Pasting

Having cut a number of lengths, place them pattern-side down upon the table. They will be longer than the table: the surplus paper should overhang equally at each end. The front edges should be level with the outer edge of the table. Bring the top length forward till it is level with the front edge of the table; at the same time moving it to the right so that the overhanging

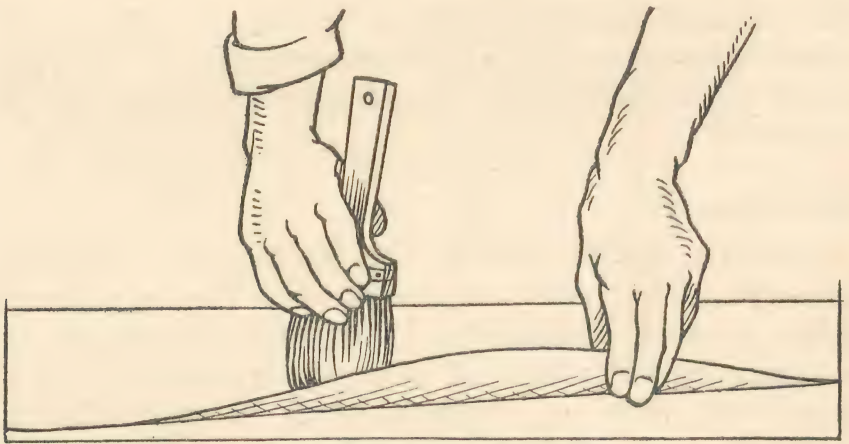


FIG. 3. PASTING THE EDGE

portion to the left is flat on the table in position for pasting. Paste from the centre; the paste should be worked to the front edge and then again from the centre to the outer edge. The front edge can be easily manipulated, but when doing the outer edge care is needed to prevent the paste from getting on the front surface of the paper. The craftsman overcomes this difficulty by using the fingers of his left hand to lift the edge of the paper slightly off the table, and by pressing his thumb down upon the paper, to steady it, gently brushes the paste along the edge. When well over half has been pasted it should be folded over. To do this move toward the left, and lift the two corners vertically and at the same time forward sufficiently to allow you to drop them into position. When this is done correctly the edges should come together accurately.

Smooth the paper gently together, but do not make the bend

tight, as this might damage the paper. The two corners should be bent back a small distance, so that they can be easily unfolded when required.

To paste the rest of the length, the paper should be removed

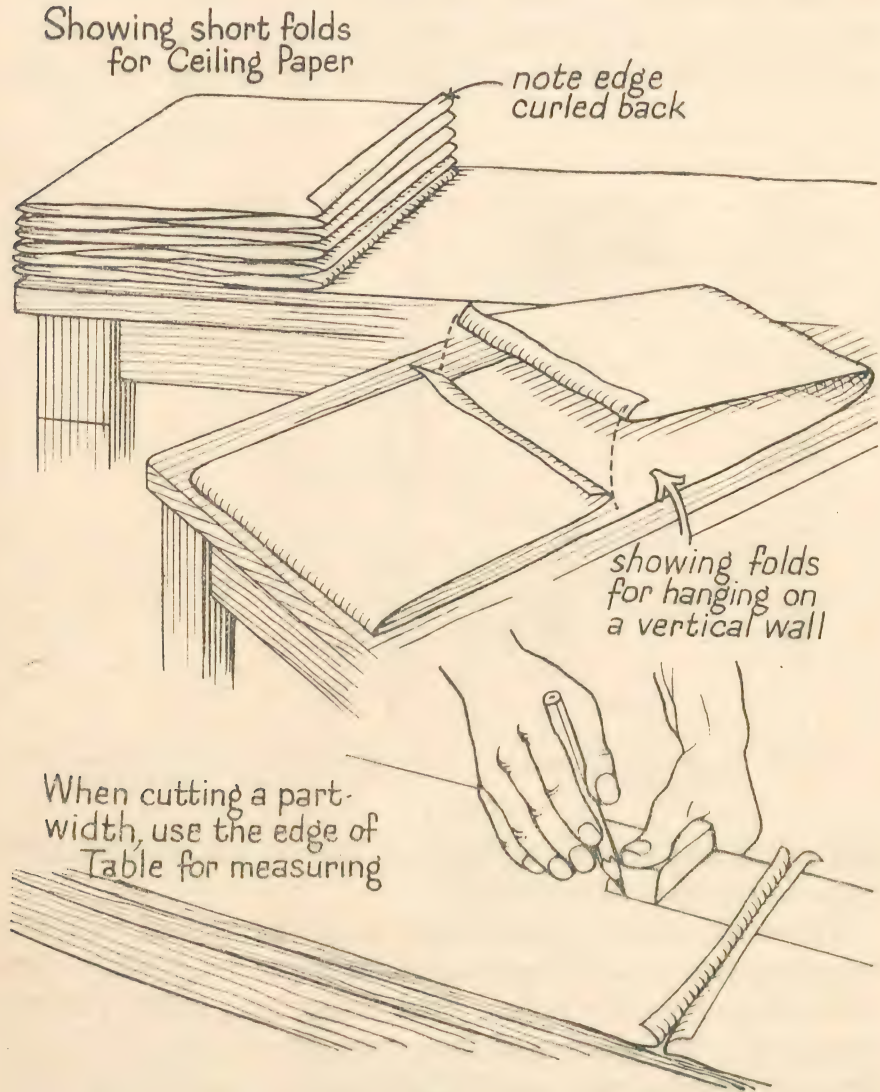


FIG. 4

to the left, so that the other end is now flat on the table; paste as before. When folded, no pasted portion should be uncovered, except the corners of the folds which you have turned back to assist you when hanging the paper to the walls.

To ensure the paper is properly pasted it is usual to go over each part twice. Before putting the paper on to the wall it

should be allowed to remain for a short time, so that the paste may properly saturate the paper and make it more pliable.

Hanging

Have everything ready before you bring your paper to the wall : steps should be in position so that the wall can be comfortably reached at the height required, your smoothing-out brush,



FIG. 5. BRINGING THE EDGES TOGETHER

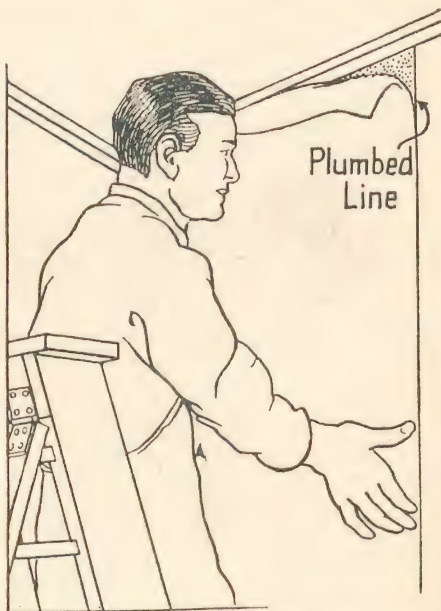


FIG. 6. HANGING THE FIRST PIECE CAREFULLY ADJUSTED TO THE PLUMBED LINE

soft pencil and scissors to hand, so that no interruption need occur in the operation of fitting.

The work, as already explained, should be started from the principal window of the room, and the paper hung with butted joints away from the light. Your fitting line, unless you are arranging for the centring of the pattern, should be marked upon the wall, and its exact position plumbed to ensure your work being true. The pasted length should be draped over the left arm, the top portion being on the inside between the body and the arm, the folded portions being upper most and the two corners turned back. You can then unfold readily without fumbling. Mount your steps. Take the right-hand corner of the top fold, which should be nearest to your body, and using the finger and thumb of the right hand allow the other fingers to

pass under the surface of the paper to support it. Releasing your arm, you take hold of the other corner of the top fold, lifting it gently, and let it drop into place; you are now ready to find its position on the wall. Do not forget when you place the top of the paper in position that you have allowed three inches at the top for trimming. This should be bent forward until you are ready to fit the top, otherwise the paste will be liable to get



FIG. 7. TRIMMING THE TOP EDGE

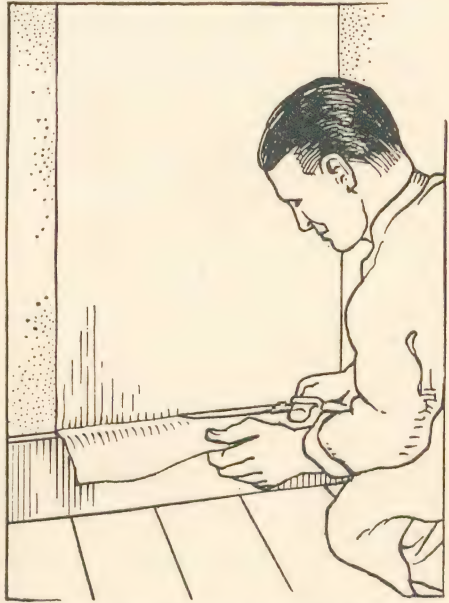


FIG. 8. FITTING THE LOWER EDGE

on to the ceiling. Fit the right-hand edge carefully along your line, holding the paper away from the wall with the left hand while you are manipulating it. When you are satisfied that the edge is correctly placed in position, use your brush to smooth the paper to the wall from the edge to the centre, and then upwards, pressing gently into the angle of the wall at the top. With the back edge of your scissors run along the paper at the angle, making a groove sufficiently deep to cut along where the paper has been drawn far enough away from the wall to allow for the insertion of the scissors. Then brush the paper into position.

The lower fold can now receive attention. The projecting corner, which will be toward the wall, can be drawn down, and the pasted surface kept away from the wall on the left side until you have fitted the line. Brush the paper to the wall downwards from right to left. The bottom of the length will be finished by

marking with the back end of the scissors, and then pulling the paper away from the wall so that it can be cut through and brushed back.

To hang the second length

Follow the same procedure, joining the second length to the first in a seam with butted edges, tightly made without any overlapping, and with the exact continuity of the pattern preserved.

If you are making your joins on the right-hand side, the paper



FIG. 9. MATCHING THE PATTERN

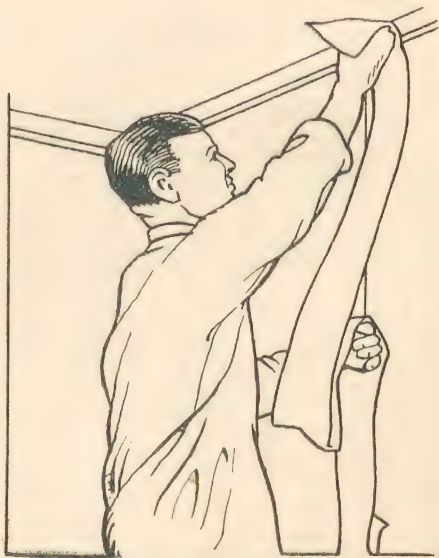


FIG. 10. HANGING THE SECOND PIECE

will be handed to the wall as before and folded with the corners of the folds turned back, so that they are readily accessible. The top fold is operated as before. When freeing the fold do not entirely leave free, but take a piece slightly looped over the left forearm; this will assist you in keeping that portion away from the wall while you are getting it into position at the top. Lightly attach the paper to the wall, approximately in position on the left hand side by using the right hand. The opposite side will be held away from the wall and supported over the forearm until the right corner has been correctly placed. Use the right hand with the fingers outstretched lying lightly upon the paper. Use your left hand to bring the edge into position. When this has been done, slide your right hand to the top to manipulate the right-hand corner until the remaining edge has been fitted. Then

the arm may be withdrawn and the paper smoothed out with the palm. At the same time, smooth the paper to the wall by working your brush from left to right before dealing with the lower fold. The lower fold is released by drawing the paper lightly forward using the edges which are turned up to free the fold. This allows the fold to drop down before you continue to fit your line. Continue by keeping the right end sufficiently free from the wall to allow the necessary movement. Both ends must be properly pressed into position and trimmed by the same method used for your first length. Your job can be completed by the successive lengths being hung by the same method. The craftsman must check with the plumb line where a long flank has to be done and this operation applied occasionally will assure the correct hanging of the paper.

Internal angles

It is highly probable that less than a full width of paper will be required to cover exactly the last portion of the wall before the angle is reached. If this is so, take the measurement for the width at the top, centre and at the base, and if they vary slightly at these points accept the greater measurement for the width. Paste and fold the length of paper and cut to the required dimension, but do not carry the full width of the paper round the corner, as it will probably shrink away when it dries. The portion cut off should be used to hang on the return flank. Take the necessary measurements; mark and plumb the wall, then fit to your plumbed line and carry on. The plumb line is particularly necessary to re-establish the vertical after you have turned the corner. In an angle which is external to the wall precautionary measures will need to be taken when the angle is turned. If the two pieces of paper are simply brought flush to the angle with the seam on the intersection, the join is liable to open. It is consequently advisable to "bind" the corner by carrying one of the joints slightly round the angle.

The chimney breast constitutes the focus of the room, and it is very important that the pattern should be well disposed upon it. Any important unit that the pattern may contain should be centred over this feature. A length hung in the centre with a subsidiary length on either side will solve the problem.

Patterns which require centring

Some papers have designs which rely upon the importance of a particular unit making a bold emphatic display of pattern. It is usually desirable that they should be centred on the more important walls. Should this be necessary, the centre of the wall must be found by measurement. This done, take a roll of paper and from the centre line find the number of widths of paper required to reach the angle of the flank. An alternative method is to divide a width on each side of the centre line, and from the

half-width point count the number of lengths required.

“Styling” and bordering can often be used in cases of large patterns otherwise difficult to dispose of.

When it is required to fit a length over an electric light switch or similar fitting, the paper should have a horizontal cut made in it to cross the centre where the fitting comes, and then a vertical cut through the centre of the cut. The job is completed by cutting diagonals right and left. The paper can then be

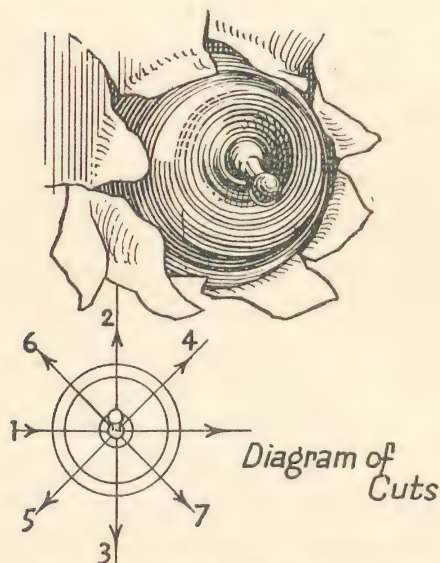


FIG. 11. FITTING ROUND A LIGHT SWITCH

passed over the fitting, trimmed, and pressed back to the wall.

Hanging ceiling papers

The methods used for hanging ceiling papers have much in common with those adopted for wall-papers, but owing to the lengths used, and the fact that they are to be attached to a horizontal overhead surface, handling the paper, as well as folding it after pasting, has to be varied.

At the time of pasting, the paper must be folded into a series of small folds overlying one another. (See Fig. 4, p. III.) When these are carried into position for hanging, a roll of paper is placed on the top of the folds. Then, handling the roll with the left hand, they may easily be turned so that the roll is underneath. This is done by inserting the palm of the right hand

under the folds to support them during the operation. Most craftsmen prefer to hang the lengths parallel to the wall which is at right angles to the window, but it may be desirable to select the wall the direction of which allows you to use the shortest length. The position which you select for the first length depends upon the conditions existing. Should there be a central feature, such as a pendant, it will be found convenient to strike a line through the centre of the feature and place the lengths on either side. But upon your own judgment in dealing with any irregularities in the plan of the ceiling the final decision must rest. The method most generally successful is to hang the lengths parallel to the wall and running away from the light. Your line must be shaped to indicate the position for fitting the first length, after which the succession of lengths will be carried on to match, always with the seams carefully butted sound and tight.

To hang the paper great care and patience are necessary. Fix your board to cover the complete length of your ceiling, and for this you will require two pairs of steps to support it. Its height should allow you conveniently to place both your hands, with the palms down, flat upon the ceiling. The paper must be brought into position, folded as described, and supported centrally across a roll of paper. Do not forget that in all lengths three inches surplus is allowed at each end for trimming. The left hand must support the roll, with the folded paper uppermost. The starting edge of the first fold is turned back to allow of unfolding without trouble. The first fold is placed in position at the starting point, fitted to the snapped line on the right and eased into the correct position by using the right hand.



FIG. 12

The supporting roll is held close to the ceiling with the left hand, while the right is left free so that the end of the first fold of the paper can be taken to the near corner and placed correctly in position on your "snapped" line. When it is in position, brush lightly across the end to ensure it adhering to the ceiling. You should now be able to walk along, unfolding the paper from the pile you are supporting with your left hand as you proceed, and fitting it to the line during the process by brushing first down the centre, then outward to the edge. Care must be taken that the paper fits to the line during the operation. Do not unfold the paper beyond your capacity for fixing, and remember that

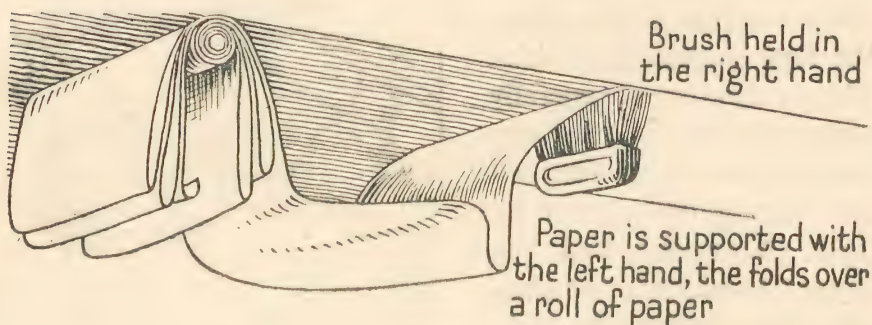


FIG. 13

the accurate matching of the pattern of the successive lengths is of vital importance.

Whenever heavy papers are used the joints must be rolled down securely before the paste is thoroughly dry.

It is not always possible during the progress of work to keep the surrounding surfaces, paintwork, etc., free from paste. Surrounds should always be examined, and any surplus paste carefully removed immediately by washing with clean water applied with a sponge. Furthermore, your hands and all your tools should be kept clean.

Panelling and cut-out schemes

These provide alternatives to the straight run of ordinary papers. The manufacturers have devoted considerable space to them in their showrooms, where the examples shown reflect the close co-operation of designers and craftsmen.

Borders, dados, friezes are all familiar forms of decoration.

Designers have added widely to these details of wall-covering by the use of plain and patterned papers applied to "cut-outs."

"Individual" treatment

To most people the personal or individual treatment of their rooms will have a strong appeal. In wall-paper, repeating patterns fulfil many purposes of decoration, but their repetition in design and colour rigidly limits their adaptability. A closer adjustment between furniture and background can be achieved if we choose a paper with no pattern at all but possessed of pleasant colour and texture.

Plain wall-papers have enormous possibilities in the adjustment of decorative schemes where existing portions of colour and fixtures cannot be altered, since the decorative value of such papers is limited only by the personal taste and skill of the decorator. An almost unlimited range of panel treatments can be created. The panel method of treating a wall-surface preserves balance and supplies emphasis where required. Proportions—width to height or length to breadth—may be disappointing, but by using your wall-papers in panels proportional defects can be corrected.

Panelling and proportion

Fig. 14 shows how a wall may be divided horizontally; and also shows a wall of the same proportions divided vertically by means of panels. The divisions in Fig. 14 are made by the introduction of a picture and dado rail, the cornice and skirting board being also indicated. In this example these divisions create an allusion of the wall being long and low. The second example, in which panels have been introduced, though similar in proportion, has the appearance of being higher and not so long. The side panels also create a central focus. The introduction of vertical or horizontal lines does not of course alter the actual proportions; they merely influence the visual conception of a room.

Before elaborating the treatment of panel motives or stiling borders a review of the available materials for this purpose will be useful.

Borders are printed upon paper which is 21 in. wide, which allows for two or more units of the pattern to be printed

horizontally on the same width. The width of the individual borders varies, but is always less than 7 in. Beyond that width it is termed a frieze motif. These friezes will range from 7 in. to 10 in., but in exceptional cases are as wide as 21 in. They can be sufficiently important in their design as to constitute the only pattern introduced on a wall, or, on the other hand, they may be merely a contribution to a complete scheme.

Picture and dado rails will probably have been fixed by the builder. But if for any reason they are unsightly or undesirable

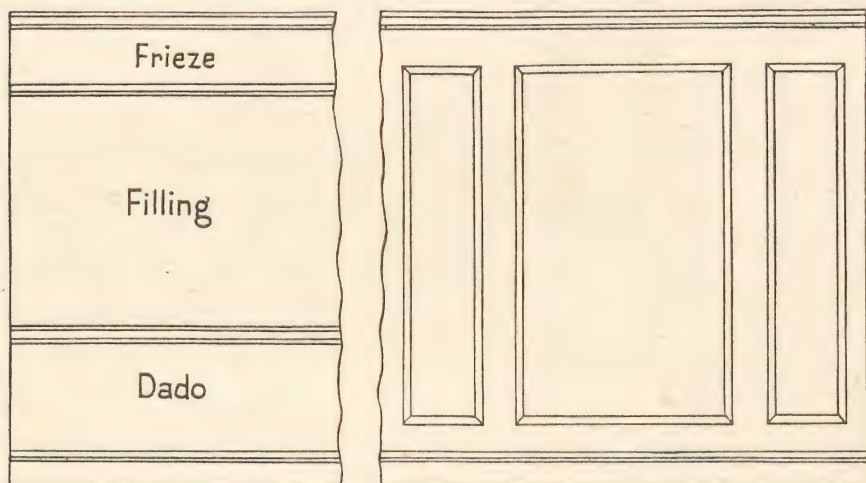


FIG. 14

they can be easily removed and the nail-holes in the plaster filled. In this case the wall surface may be treated as one large panel, or sub-divided to form a series of panels—a central panel supported by a smaller panel on either side, for example.

The arrangement of such panels is a matter for individual taste. Where rooms are large and the furniture and fittings are of sufficient importance more important panels can be created. For this purpose special motives known as “appliqués” are prepared. Among the many available are those intended as corner decorations for the panels. Others form a decoration for the whole of the field or wall flank. Figs. 15 and 16 show suggested treatments of appliqué work.

The series of sketches which accompany this article are intended to illustrate the uses of stilings and borders in panelling. It should be realized, however, that these only represent a few

of the innumerable possibilities they offer the decorator. Further ideas and inspiration may be obtained by the study of traditional work, particularly that of the Adam brothers and the wood panelling of the early eighteenth century.

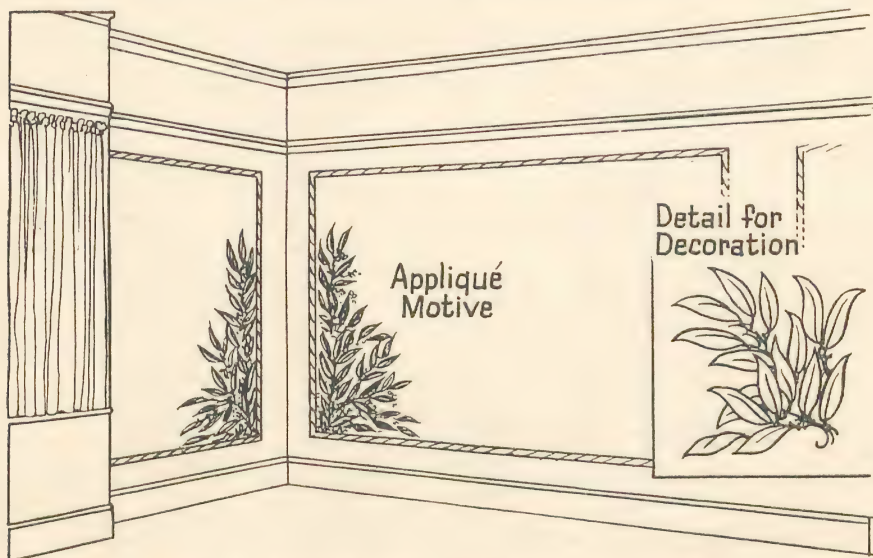


FIG. 15. STILED PANELS—WITH APPLIQUÉ MOTIVE

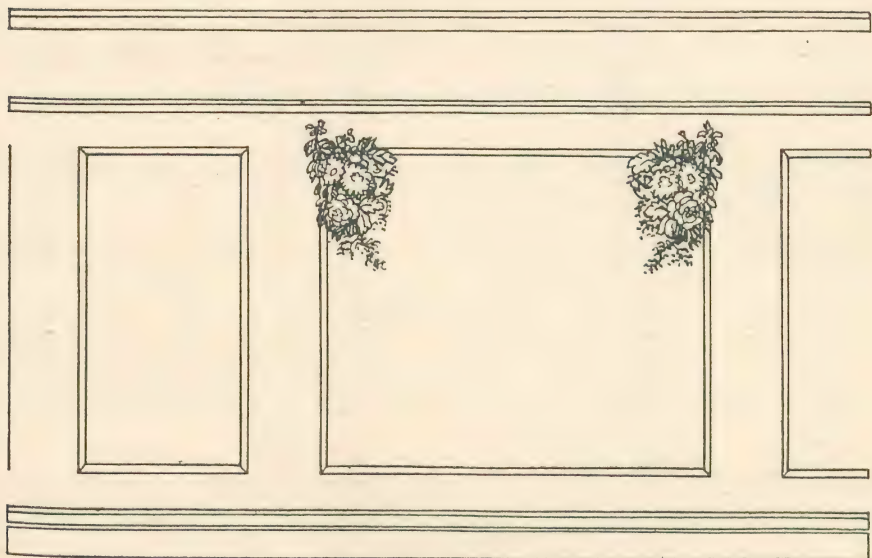


FIG. 16. ENRICHED APPLIQUÉ CORNERS

In panelling walls a proper sequence for the work must be decided upon before you commence. First the wall must be hung with a plain paper carefully selected for colour and texture.

It must be hung with butted joints and seams. Before the panelling itself is attempted a dimensional sketch of the proposed arrangement, sufficiently complete to be used as a working

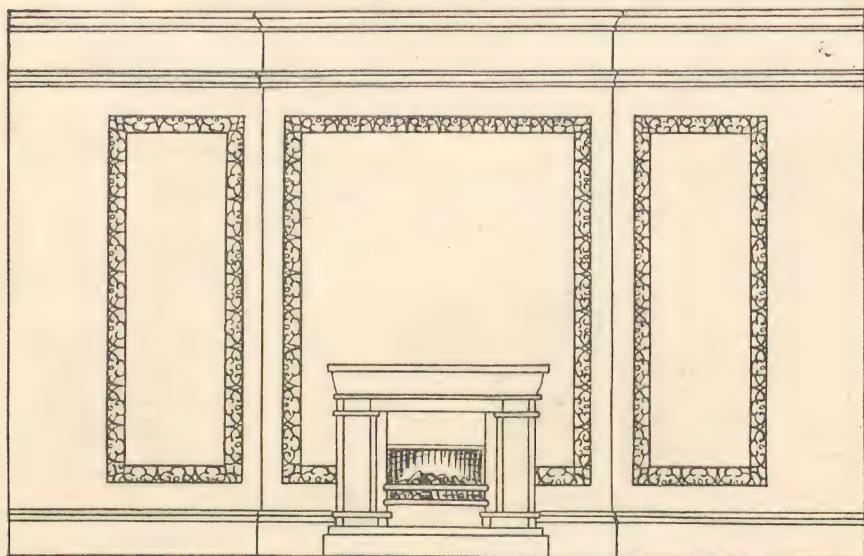


FIG. 17. FOCUS OF ROOM—USING STILING BORDER TO PRODUCE PANELS

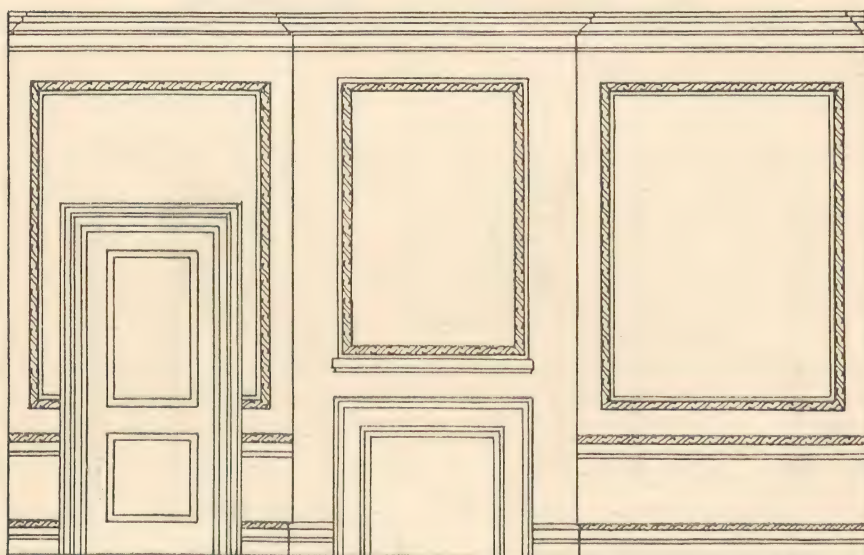


FIG. 18. PANEL GROUP—WITH A STILING BORDER

drawing, must be made. In connection with this work sectional squared paper is particularly helpful. When designing your arrangement the placing of the more important items of furniture should be taken into account, and the sequence of the panels

made as a background to these units. Your own personal taste, not too rigidly hampered by rules of design, should accept the responsibility of creating this background.

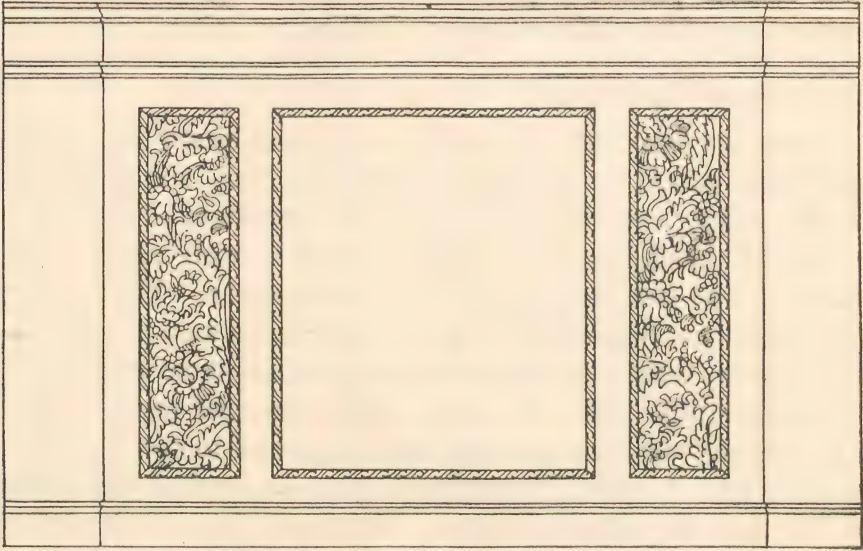


FIG. 19. PANEL MOTIVE WITH TWO WALL-PAPERS AND A STILING BORDER

Setting out of the panels

Setting out the panels in full scale on the wall surface follows the making of the dimensional sketch which forms your working drawing. All the lines of the design must be accurately drawn on

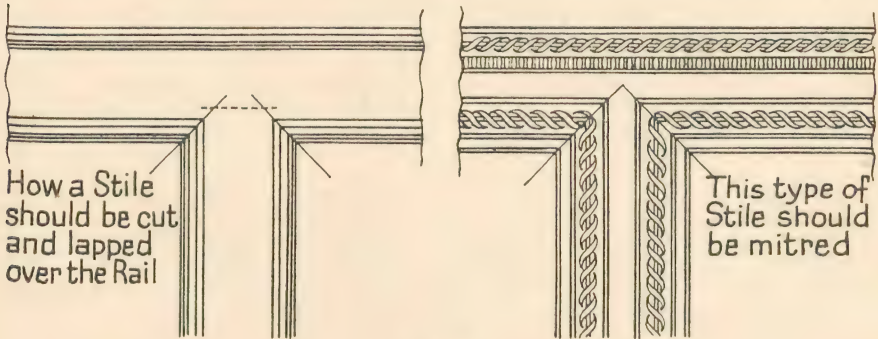


FIG. 20

the surface of the wall, all vertical and horizontal lines, in particular, being absolutely true. All angles of the panels must be right angles, and pairs of lines strictly parallel, for any inaccuracy will become emphasized in the finished work.

For panels which are to be enclosed, the stiling and border

constitute the framing. Interesting effects of contrast can be obtained within the enclosed field of the pattern: further variations result from alternating large panels of simple colour with smaller patterned panels. The detail Fig. 20 shows the method by which different types of stiling are mitred.

“Appliqué” motives

These motives can be used over background to enrich particular panels or portions of them. They are somewhat similar to a typical border but are more important. They have a pattern which possesses irregular edges, such edges being perforated so that they tear clear of the pattern. These types vary: many are simple border motives which are easy to manipulate, others, with important motives, require some practice to use successfully. Manufacturers display most of these in their relative positions, and the decorator is advised to see them first in this way. A useful illustrative diagram is supplied with many of the more important designs. When you have decided that they are to form part of your scheme, pin them into position before finally fixing. Figs. 15 and 16 give some idea as to their use.

SECTION V

HANDICRAFTS

CHAPTER XXXI

WOODWORK

TOOLS AND SIMPLE JOINTS

Woodwork is the most popular of all the handicraft hobbies. The majority of boys receive basic instruction in the use of woodworking tools during their school days and experience the satisfaction of making a few articles in wood in the course of this training, and the normal interest of every healthy boy in whittling wood is thus canalized.

In order that the hobby of woodwork shall be a successful one, it is vitally necessary to remember that the handicraft centre at school was stocked with racks of good tools, and that these were kept sharp and in good order under the superintendency of an experienced instructor. It is essential that the amateur makes up his mind to provide himself with an outfit of good tools and that he is careful to look after them properly. In the choice of tools he should be guided by the advice either of the assistant in a reputable tool store, or of an experienced friend, a professional for choice.

There are about half a dozen famous names in the world of woodworking tools, firms whose products are found on every joiner's bench and which are guaranteed to give lasting satisfaction. The few extra shillings these tools cost over their cheaper prototypes are repaid by years of good service.

Most of the usual tools will be mentioned in this section, but it is obviously impossible to deal with all the scores of tools evolved for the working of wood. Nor is it considered necessary for the amateur to acquire expensive specialist tools. Most of the normal operations involved in simple carpentry and joinery may be performed by the use of those listed here.

Planes

The most common types of plane are the wood jack and smoothing planes. These are made of beech.

All beech planes will benefit by a soaking in linseed oil when new and a weekly dressing of oil afterwards. A convenient method of applying the oil is by stopping the mouth of the plane with putty and filling the well of the plane with the oil. It will soak into the wood and will eventually impregnate the

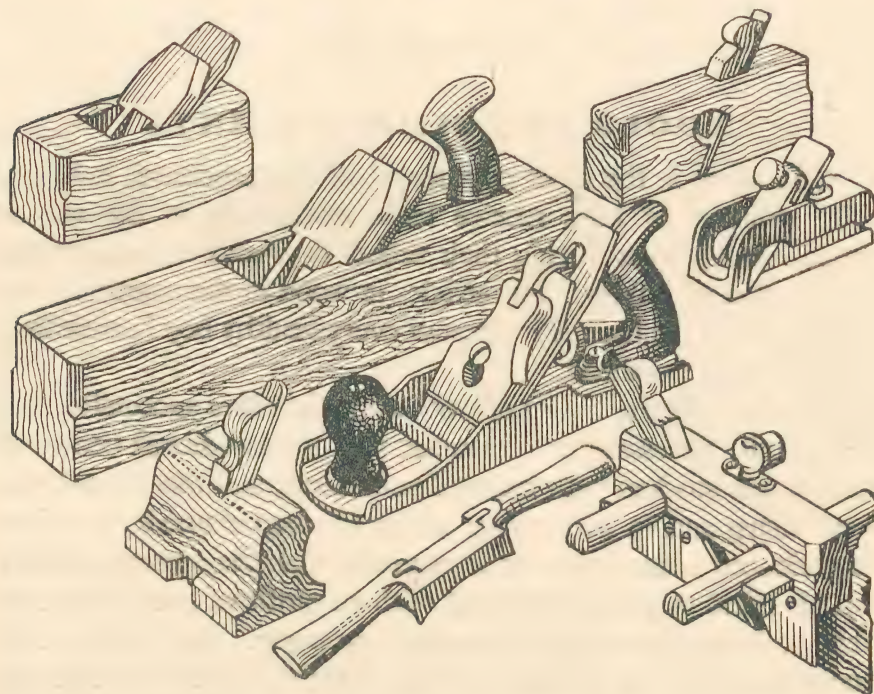


FIG. 1

whole of the plane and show on the end grain at the front and back.

The wedge. This will be perfectly fitted when the plane is purchased, and when tapped home will bed snugly into its grooves so that the plane iron is held solidly. It is slackened so that the iron may be removed for sharpening, by sharp blows on the nose in the case of the jack plane, and the back end in the case of the smoothing plane. This practice will result in hammer marks on the wood of the plane, and to prevent this it is well worth while fitting a striking nub at the points mentioned. A hole 1 in. in diameter and $\frac{1}{2}$ in. deep is bored and a wood dowel

cut to fit tightly. The dowel is given a touch of glue and driven home, and the top edges afterwards rounded as shown in the illustration. The dowel is cut so that the surface struck by the hammer is end grain.

The wedge should not be left driven tightly in the plane for long periods while not in use, but should be slackened, otherwise the tension at the middle of the plane will eventually result in the bending out of true of the working surface.

The plane iron. This is in two parts, the cutting iron and the back iron. These are adjusted by a screw so that about $\frac{1}{16}$ in. of the cutting iron projects beyond the back iron in the case of the smoothing plane, and almost $\frac{1}{8}$ in. in the case of the jack. Instructions for sharpening the cutting iron will be found on p. 141.

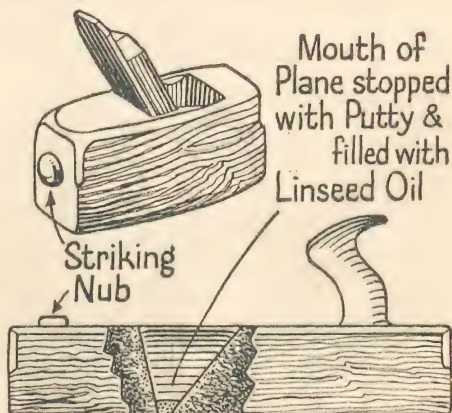


FIG. 2

The iron plane

This is in many ways the most useful plane for the amateur, and a 10-in. iron smoothing plane might well replace both the wood planes mentioned above, especially as most timber as bought is machine-prepared and therefore truing-up with the jack plane is often unnecessary.

Among the advantages of the iron plane which may be noted are: Adjustment for depth of cut by a knurled nut and lateral adjustment by a lever; adjustment of the mouth by set screws; and a practically unwearable working surface. The only drawback of the iron plane is the brittleness of the casting, which will rarely survive dropping on a hard floor.

Rebate plane

This is used to produce recesses in the manner shown in the illustration. The extent of the rebate is first defined by gauge marks on the edge and face of the timber. Large rebates may

be rough cut by the use of the chisel, and finally planed down to their correct dimensions with the rebate plane.

Another method of commencing a rebate is by a guide or fence to the gauge line in the form of a length of square-edge wood held by G-cramps. The plough may also be used in the forming of a rebate in the manner shown.

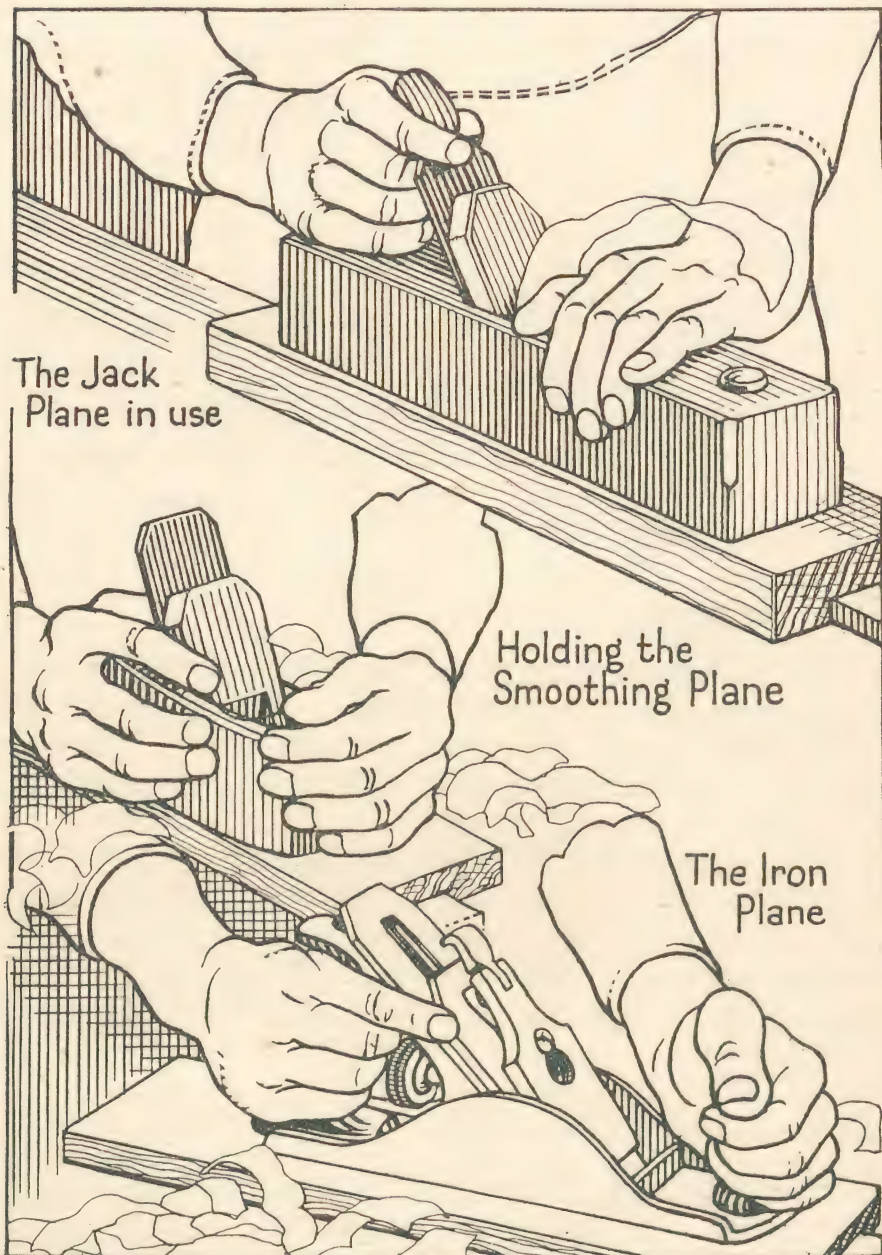


FIG. 3

Bullnose plane

This is used when working up into a corner as in the case of the stopped rebate shown, and may also be set to produce a smooth finish to a rebate in hard wood.

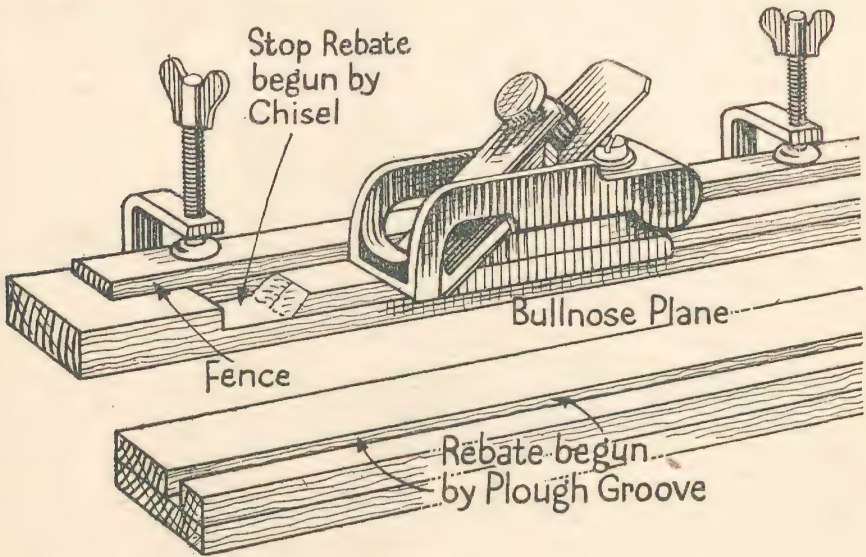


FIG. 4

Router

The router, or "Old Woman's Tooth" as it is often called, is used when forming a housing or groove across the grain of the wood. The groove is first roughed out by the chisel and then taken down to its correct depth with the router.

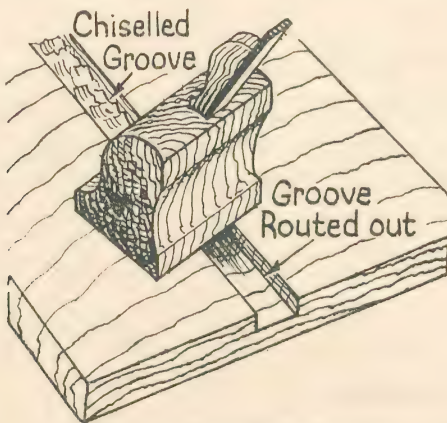


FIG. 5. USE OF THE ROUTER

The plough

This is used to make grooves such as those in the edge of framing to receive a panel. It is usually supplied with eight

irons of varying widths and is adjustable to depth, and by means of a movable fence the distance of the groove from the edge of the timber may be set. It is also used, as mentioned previously, in the commencement of a rebate.

In use the plough groove is commenced at the front of the

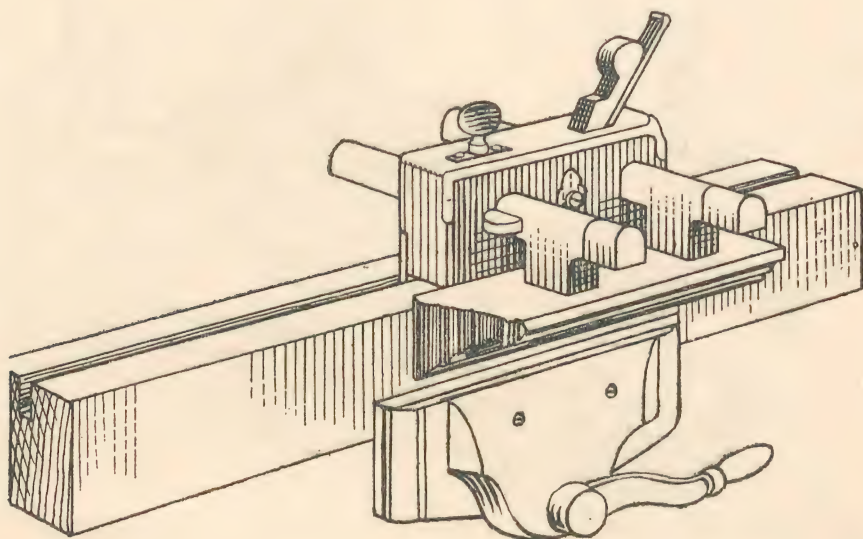


FIG. 6

work to its full depth and worked backward through the length of the timber.

The spokeshave

The spokeshave is used to make or finish curved surfaces in wood. The wooden spokeshave is made of beech or boxwood and may be used either on outside or inside curves. Like all the planes mentioned in this section, it has its metal counterpart, usually with screw adjustment to the cutting iron. Differing types of spokeshave are also made for convex and concave surfaces.

The cabinet scraper

While not, strictly speaking, a plane at all, the cabinet scraper performs the functions of a plane. By its use fine shavings are produced which leave a smooth surface, and it is much used after the passage of the plane and before glass-papering. The

cutting edge is produced by turning up a burr on the edge of the steel in the manner described in the subsection on sharpening edge tools, and the accompanying illustration shows the manner in which it is used.

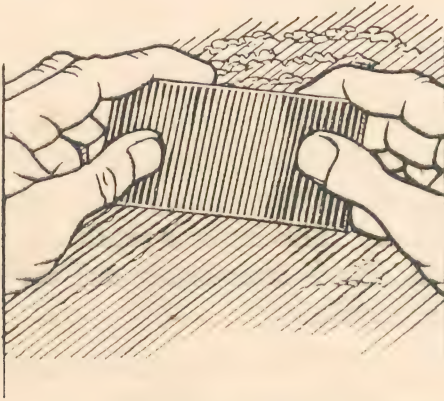


FIG. 7. USING THE CABINET SCRAPER

Handled scrapers in various designs are now produced, and these have removable cutting edges. They are extremely useful, and not only produce a fine smooth surface for cabinet work, but may be used for much rougher jobs, like floor scraping or paint removing, without damage to the tool.

Saws :

The handsaw

This is the general purpose saw. The most useful size is 26 in., with 8 teeth to the inch. The illustration shows the skew-backed type, but this has no advantage beyond that of appearance over the straight-backed saw. It may be used either for cross-cutting—that is, sawing across the grain—or ripping with the grain.

The main differences between the good quality saw and the

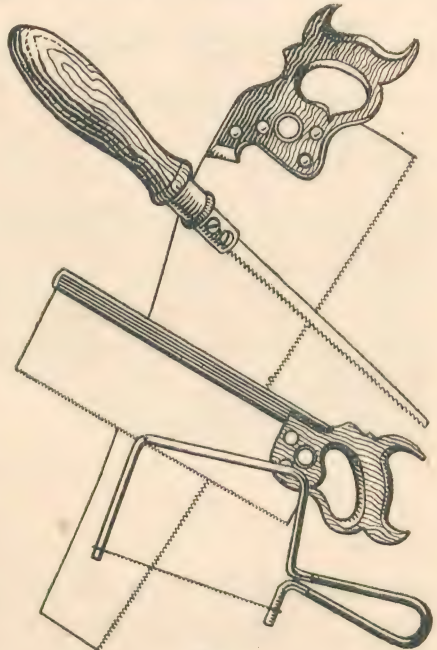


FIG. 8

cheaper variety are in the quality and temper of the steel and in the taper grind. This latter process produces a blade which is thinner at the back edge than at the cutting edge, and is thus less likely to "bind" or stick in the cut.

Tenon saw

The thin blade of this saw is stiffened by a grooved iron or brass back. The 12-in. size is the most useful, though many craftsmen use a 14-in. for fairly heavy work and employ a dovetail saw for fine work. This latter is similar to a tenon saw, but is only about 8 in., has a finer blade, and sometimes an open instead of a closed handle.

Coping saw

One of the most useful tools in the kit, the coping saw takes the place of both the bow saw and the fretsaw. The blade may be moved axially and is used, like a fretsaw, under tension. Its hooked teeth cut with great rapidity, and as the blade is so narrow, the most intricate designs may be followed. By detaching one end of the blade it may be passed through a hole and used to cut a design in, for instance, a fretted panel.

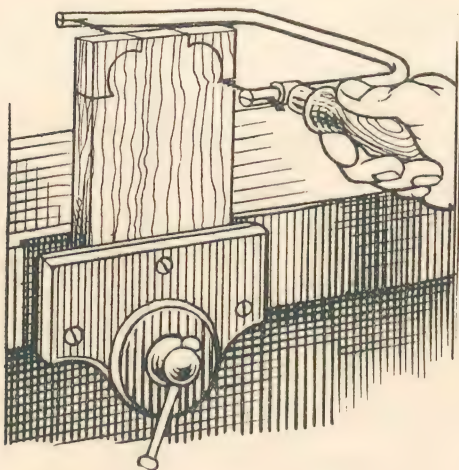


FIG. 9

Keyhole saw

Originally intended, as its name implies, for the cutting of keyholes, this saw has a variety of uses. It is shown in use in cutting a floorboard so that it may be lifted for repair.

Saws should never be used when they are in need of sharpening. The extra force applied in cutting with a dull saw makes for bad work and may easily buckle or distort the blade. Saw

sharpening is a job for the expert, and most good tool shops employ, or are in contact with, a saw sharpener. It is much better for the amateur to pay a few pence and wait a day or two while his saw is sharpened properly than to risk damaging it by his own unskilled efforts.

Boring tools

The illustration shows the more usual tools under this heading. A good quality brace will have ball bearings and will be equipped with a ratchet attachment to enable it to be used in a corner where the full sweep of the brace is impossible. Twist bits are used when holes are

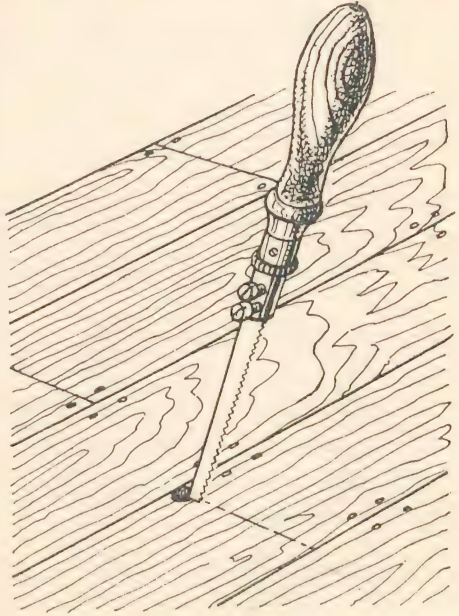


FIG. 10

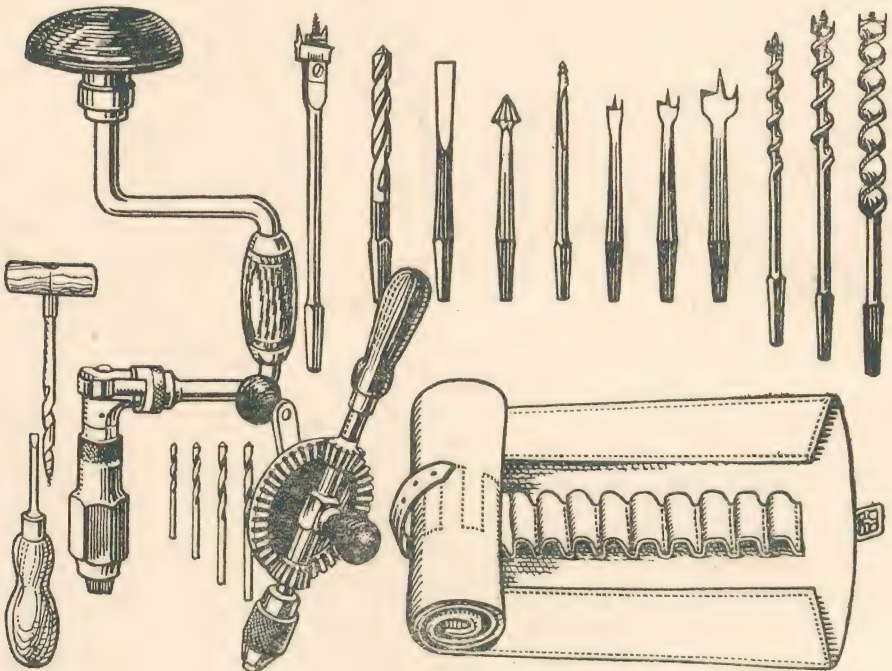


FIG. 11

needed through thick timber, and may be had in sizes from $\frac{1}{4}$ in. to $1\frac{1}{2}$ in. and larger, graduated in $\frac{1}{16}$ in. The amateur will find that $\frac{1}{4}$ -in., $\frac{3}{8}$ -in., $\frac{1}{2}$ -in. and $\frac{3}{4}$ -in. sizes will be sufficient, especially if he invests in an expansive bit, which by adjustment of the cutter may be used for boring holes of up to 3 in. in diameter.

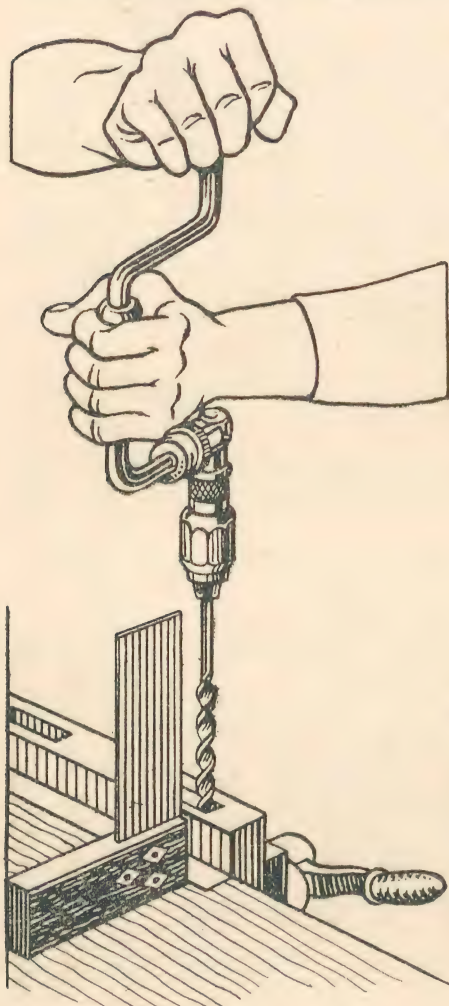


FIG. 12

Centre bits are used for boring more shallow holes, and here again three or four of the more usual sizes will suffice. When it is required to bore a hole right through a piece of timber with a centre bit, the timber is reversed when the point of the bit shows on the

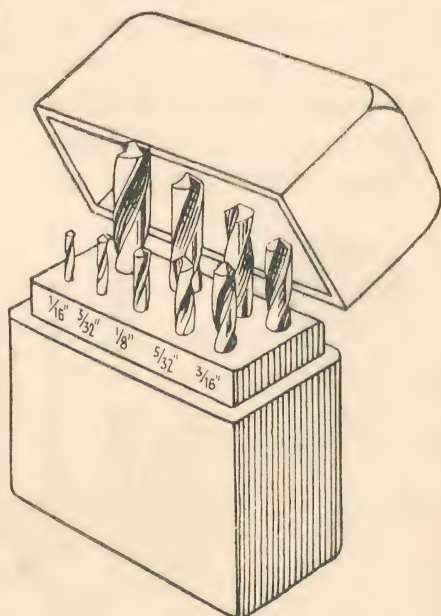


FIG. 13

under side and the boring of the hole completed from that side.

When using a twist bit, it will assist in keeping the bit quite plumb if a square is used in the manner shown in the illustration.

The bit roll is a necessity. The points and cutting edges of bits are very delicate and easily spoiled if the bit is allowed to lie around. They are sharpened by the use of small fine files,

and care is necessary in maintaining the correct bevel of the cutting edges. Carefully used, any bit will last a lifetime, but carelessness and rough treatment will ruin it in a moment.

Morse drills are comparatively cheap, and it is a good idea to purchase a set in sizes from $\frac{1}{16}$ in. to $\frac{1}{4}$ in., rising in $\frac{1}{32}$ nds. A convenient wooden case such as that illustrated is easily made. They are used in the wheel brace shown in the illustration. Morse drills may also be had which have a square shank. An example is shown. These are used in the ordinary ratchet brace. The screwdriver bit is very useful when a large number of screws have to be driven. Great pressure may be exerted on a screwdriver bit, and it is often useful, therefore, for withdrawing a particularly obstinate screw. The gimlet bit is used in place of the gimlet, and for the same purpose, that is, to make preparation for the entry of a screw, usually in soft wood.

The bradawl is the most generally misused of boring tools, yet it amply repays a little consideration. A blunt bradawl will split the wood as it is driven, and nothing is more annoying than the bradawl with a loose handle. Good bradawls have a rivetted tang so that the blade can never fall out.

When using the bradawl, the blade should be set square across the grain of the wood and the tool should never be twisted from side to side. It is sharpened on the oilstone in the same way as all edge tools.

Chisels and gouges

The most useful tools under this heading are $\frac{1}{4}$ in., $\frac{1}{2}$ in., $\frac{3}{4}$ in. and $1\frac{1}{4}$ in. Firmer chisels, a 1-in. or $1\frac{1}{4}$ -in. long bevelled-edged paring chisel and a $\frac{5}{16}$ -in. and $\frac{7}{16}$ -in. mortice chisel; one $\frac{1}{2}$ -in. scribing gouge and one $\frac{3}{4}$ -in. Firmer gouge. The sizes of the mortice chisels may seem a little odd, but they will be found to be useful for mortices in timber 1 in. and $1\frac{1}{2}$ in. respectively, remembering that when the timber is prepared it will be only $\frac{7}{8}$ in. and $1\frac{3}{8}$ in. thick.

Scribing gouges are ground on the inside of the curve and Firmer gouges on the outside, and a gouge slip or shaped oilstone will be needed for them. This item is shown in the subsection on sharpening, and it will be noted that it has two sharpening edges with curves of different radii.

The paring chisel should be very carefully used and on no

account struck with the mallet or used for chopping or heavy work.

The Firmer chisels are robust in construction and may freely be used as general purpose chisels.

Two points should be mentioned. First, it is dangerous to leave chisels and gouges lying about the bench among shavings and other tools, and many cut fingers have resulted from carelessness in this respect. Also the sharp cutting edges are often nicked and spoilt by contact with other tools. The second point concerns the use of the hammer instead of the mallet when chopping with Firmer chisels. There is no defence for this practice, and chisel handles are soon split and

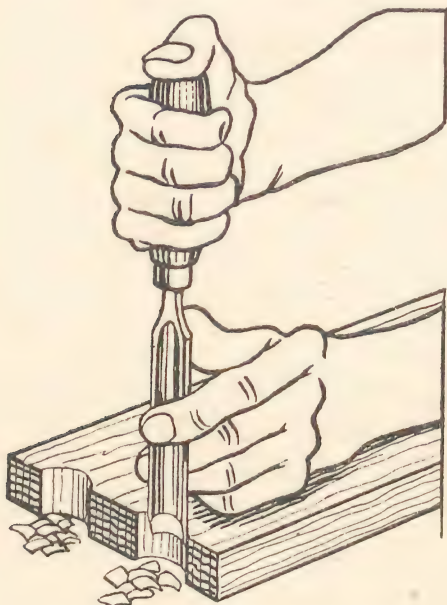


FIG. 14. SCRIBING GOUGE IN USE

ruined. The illustrations in this and other sections show typical operations involving the use of chisels and gouges.

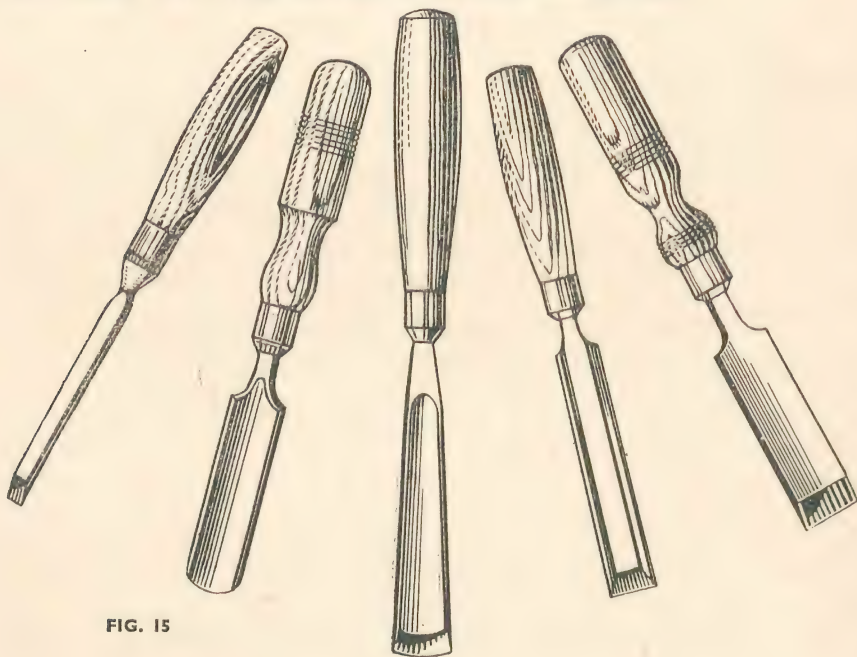


FIG. 15

Marking-out tools

These, though they be few in number, must be of the best quality, for upon their accuracy the success of any piece of work must obviously depend.

The square

The cheaper variety of square has a beech stock which is secured to the blade by three or four rivets. Better qualities are furnished with rosewood or ebony. If funds allow, two squares, one with a 12-in. blade and one with a 4-in., should be bought. If one square only is to suffice, then a 9-in. is the best size. A method

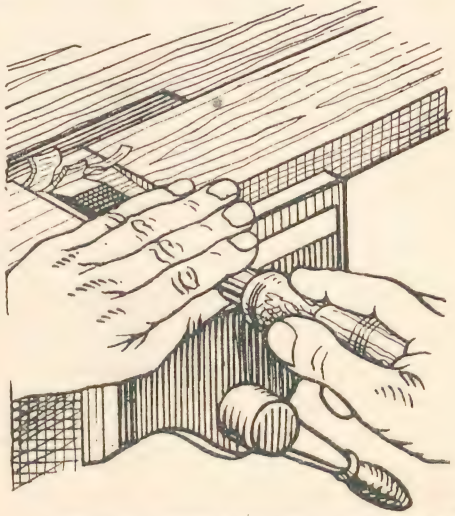


FIG. 16. FIRMER CHISEL IN USE]

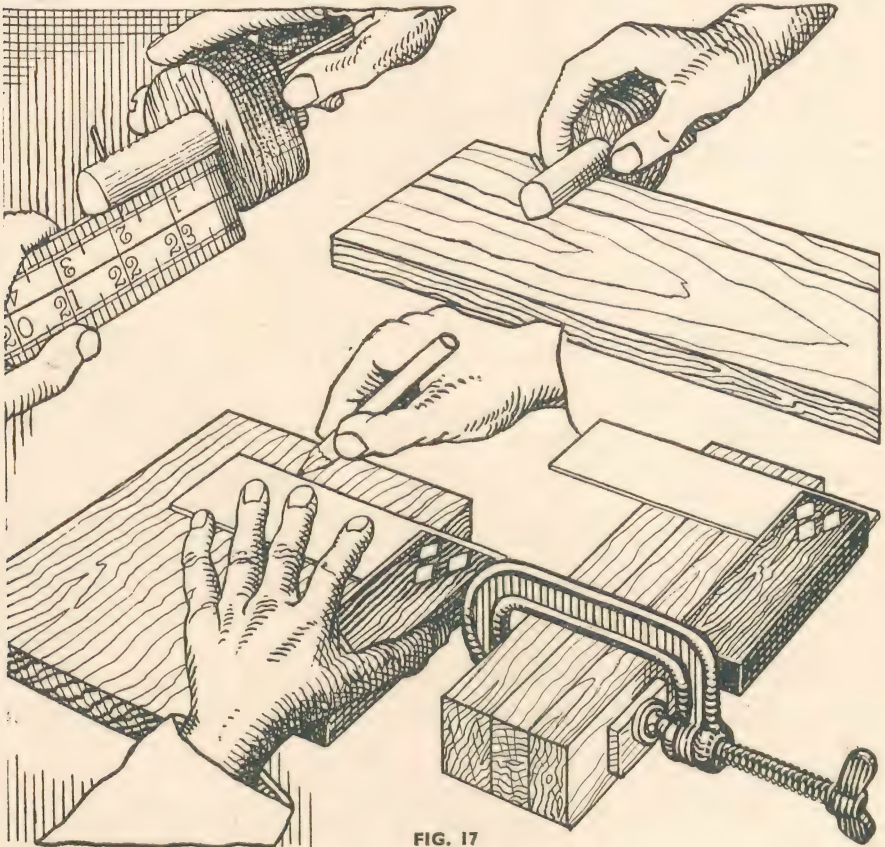


FIG. 17

of testing the square is illustrated, and a test by this method should be made from time to time, and always if the square has been dropped or has suffered any other ill-treatment. A board at least equal in width to the length of the blade, and having one edge planed straight and true, is needed. With the square held firmly, a line is cut across the board with a knife.

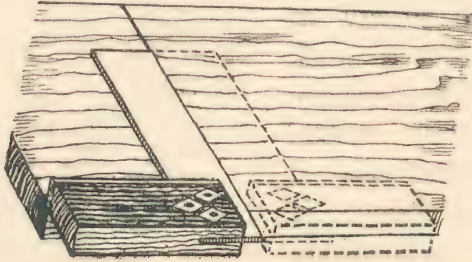


FIG. 18

The stock of the square is then reversed and the blade brought up to the line. It should exactly correspond. If it does not do so, the square is out of truth by one-half the amount of the divergence, and should be re-set by a toolmaker.

The adjustable bevel

The blade of this tool may be set to any desired angle and fixed by means of a screw in the butt. Set at an angle of

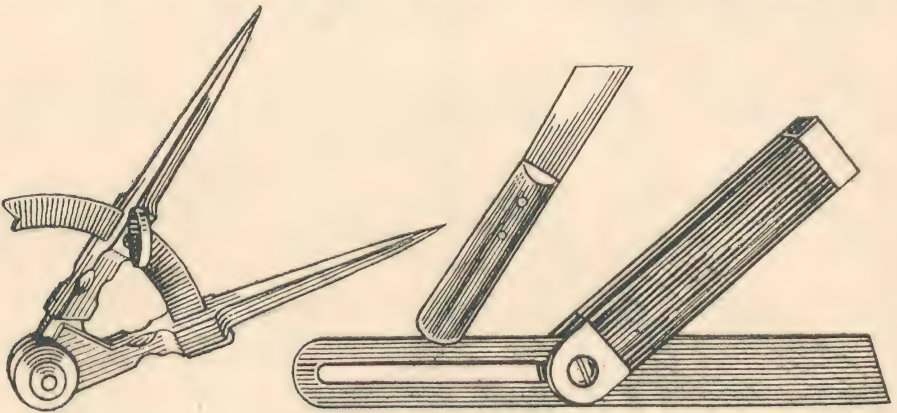


FIG. 19

45 degrees, it is a substitute for a fixed mitre square, and the purchase of this latter is generally unnecessary for the amateur.

Marking knife

This produces a finer and more accurate line than the pencil,

and should always be used for marking the shoulder lines for joints, especially in hard wood.

Gauges

The usual types of gauges are Marking, Cutting and Mortice. It will be found that two marking gauges will be adequate for almost all purposes. The cutting gauge is rarely used, and the double marks for mortices may be conveniently produced by setting the two marking gauges and using them from the face side. This point is made quite clear in the section on woodwork joints.

Compasses

A useful accessory, and the type illustrated is easily adjusted and rigid in use.

Other necessary tools which need no especial mention, such as hammer, pincers, nail punches, etc., must of course be provided, and it may well be that the amateur, becoming more enterprising with experience, will from time to time acquire other and more specialist tools, such as moulding planes, compass planes, carving tools, etc. An exhaustive list would, of course, be out of the province of this article. Suffice to say, however, that the golden rule of buying only the best possible holds good for all tools.

SHARPENING EDGE TOOLS

More accidents take place with blunt tools than with sharp ones, as a sharp tool is positive in its action and requires little force or pressure to enable it to do its work. A blunt tool, on the other hand, will slip and bounce on the work and the extra force needed to drive it to its task is a fruitful cause of trouble. Furthermore, clean exact work is quite impossible with blunt tools, and the attempt will merely produce irritation and shabby workmanship.

The oilstone

This is used to sharpen all edge tools. There are many types of oilstones available. Some are of natural stone, and a good natural stone is, in the opinion of many joiners, still the best

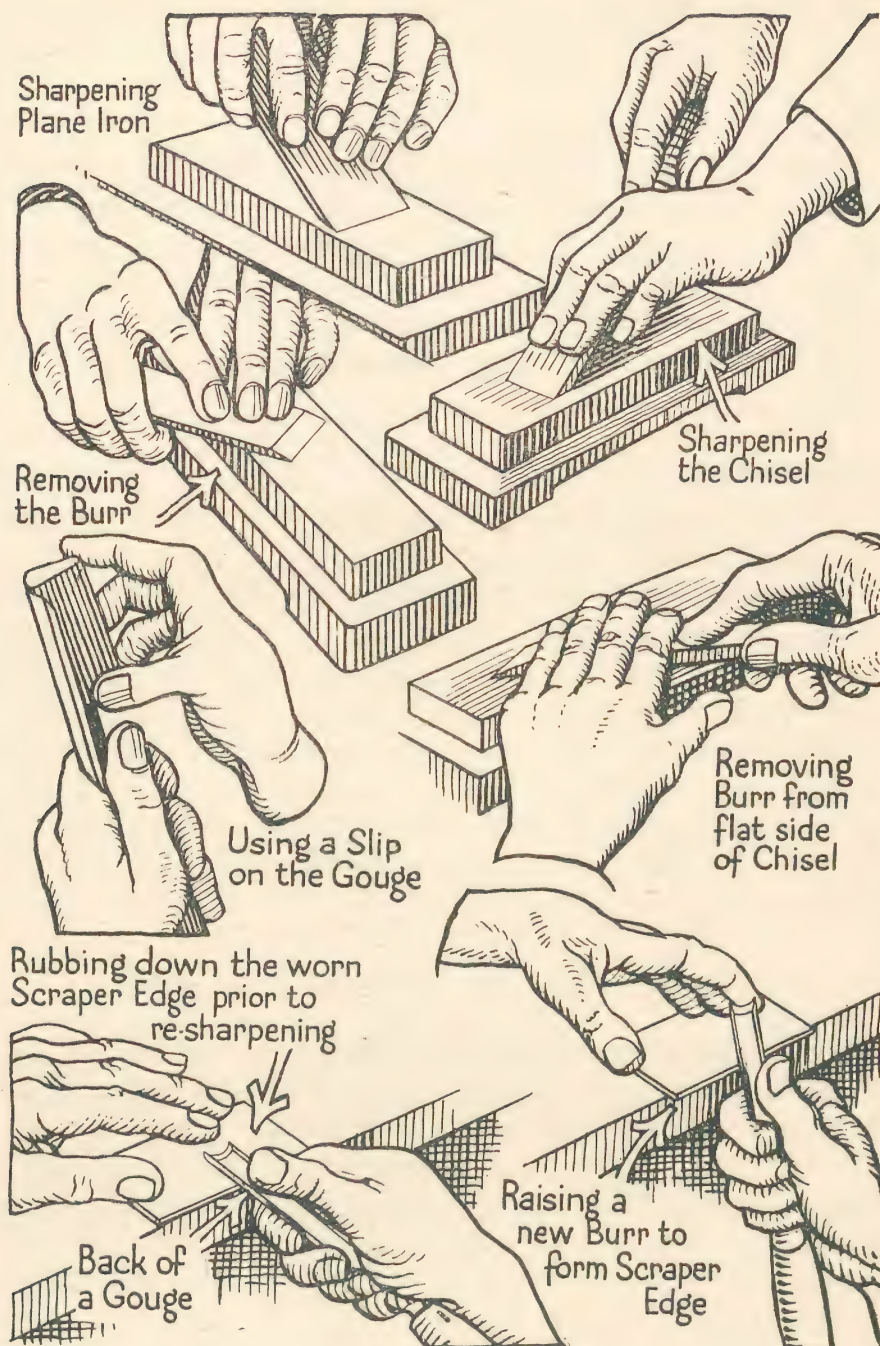


FIG. 20

sharpening medium. They are, however, liable to certain flaws or cracks, and experience is needed in their choice. The amateur would be well advised to purchase an artificial stone of

good quality. The stones are sold in varying degrees of keenness, that is, some are more quick cutting than others. A quick-cutting stone produces a coarser cutting edge than a slow-cutting stone. A medium stone should be sought, or an alternative plan is to invest in a manufactured stone which has a double face, one face being coarse and the other fine.

Most stones are sold uncased and need the protection of a wooden box, such as that shown in the illustration. A recess a little more than half the thickness of the stone is sunk into the wood of the base and lid, and the box thus formed is more substantial than one formed of thin wood.

The most useful size of stone is 9 in. or 10 in. long, 2 in. wide and 1 in. thick.

The stone should be kept covered when not in use to protect the surface from dust and grit. Cheap thick oils should be avoided as they soon form an impervious skin on the surface of the stone. A good brand of oil will be recommended at the shop at which the stone is purchased.

When using the stone, the worker should try to use all parts of the surface equally. Sharpening only on the centre of the stone will soon produce a hollow. If this occurs, the stone may be resurfaced by mixing a layer of sharp sand and water on a flat stone slab and rubbing the stone on this until a level surface is produced.

An occasional wash in paraffin will clean the stone and prevent the formation of oil film.

The gouge slip

This is a shaped piece of oilstone, used generally for sharpening gouges. A medium artificial stone should be sought. It will have two edges of different radii.

Use of the stone

When purchased, edge tools are ground but not sharpened. Usually only one face of chisels, gouges, plane irons, etc., is made of steel, and on this face is produced the cutting edge. The ground surface is laid flat on the stone and then the hands lifted very slightly so that the contact with the stone is made only at the extreme point. The tool is rubbed back and forth

the whole length of the stone and a steady even pressure maintained. The hands should move steadily through the same plane the whole time, or a round instead of a straight cutting edge will be produced.

This action will produce a burr of metal on the cutting edge, which has to be removed. This is done by turning the tool over flat on to the stone and giving it three or four strokes in this position. The experienced joiner usually completes the operation by stopping the edge on the palm of the left hand. This practice is not recommended for the amateur, but the super-fine edge thus produced may be achieved by using a strip of smooth leather fixed to a piece of wood and then used in the same way as a razor strop.

After continued sharpening the tool will become thick at the point and will need grinding. This may usually be arranged through the local tool dealer. On no account must woodworking tools be ground on an emery wheel, as the great speed results in the generation of heat which may take the temper from the steel. The grindstone used for woodworking tools revolves much more slowly and the surface of the stone is kept moistened with water.

In the case of the inside ground or scribing gouge, the tool is sharpened with the gouge slip and the burr, or wire edge as it is sometimes called, is removed on the oilstone.

The firmer, or outside ground gouge, is sharpened on the oilstone and the burr removed by the gouge slip.

The scraper

The first stage in sharpening the scraper consists of filing the edges straight and square with a flat smooth file. The file marks are then removed and the edges given a smooth finish by rubbing them on the oilstone. Care must be taken to keep the edges square on the stone. The scraper is then laid flat on the bench and a scribing gouge is rubbed along each edge in turn. The gouge must be kept quite flat on the surface of the scraper in the manner shown in the illustration. Finally the cutting edge is formed by holding the scraper on end and drawing the side of the gouge up each edge two or three times. The gouge is pressed firmly against the edge and at an angle slightly off the

square, that is to say, at a little less than 90 degrees to the face of the scraper. This produces a keen cutting edge to the tool.

To resharpen the scraper, the gouge is used to repeat the last two processes. The file and oilstone are only required occasionally when a completely new edge is to be formed.

SIMPLE WOODWORK JOINTS

Edge-to-edge joints

These are used to increase the width of timber, and with the introduction of three-ply and laminated woods, are not used nearly so much as formerly.

Butt joints. The butt joint is the most important of these, and probably the only one the amateur is likely to be called upon to undertake. In its simplest form, the edges to be joined are planed so that they are perfectly straight and true. They are then glued and the joint left to harden. The greatest care must be taken in the trueing of the edges if the joint is to be a success. If the edges are not quite square to the face, the joined board will not be flat but buckled, and if the edges are not straight the joint will gape and will break easily.

The glue is applied and the boards placed edge to edge. The upper one is rubbed backwards and forwards two or three times to expel the surplus glue and to secure perfect adhesion.

Quite short joints require no other treatment and may be carefully taken from the vice and stood by to set. If the boards are longer than the finished length, a pair of joiner's dogs may be tapped in to secure the joint until the glue has set. If, on the other hand, the board has not to be trimmed to length, corrugated joint fasteners may be driven in.

Joints of a length exceeding 3 ft. will require the use of cramp or cleats. After the dogs or joint fasteners are in place, the jointed board is laid in the cleats and the wedges tightened by light blows of the hammer. Care must be taken not to drive them up too hard or the board will buckle and the joint will be forced apart.

Butt joints exceeding 5 or 6 ft. should be further strengthened by the use of dowels. These are wooden pegs cut from dowel rod, which is bought in lengths. They are driven into holes

bored into the edge of the boards after they are planed for jointing. The illustration shows the boards held for marking and boring. The holes should be about $\frac{3}{4}$ in. deep and should be countersunk so that there is no chance of burr on the hole preventing the joint closing properly. The dowels should be cut to $1\frac{3}{8}$ -in. lengths, thus allowing $\frac{1}{8}$ in. of clearance, and they should be slightly pointed. Three dowels, equally spaced, should be used in a 6-ft. joint. Dowels are sold in diameters of $\frac{1}{4}$ in. to 1 in. A $\frac{3}{8}$ -in. dowel is used in boards 1 in. in thickness, and this proportion is observed in the illustration.

In making the joint, the dowels are glued and driven into one edge. Both edges are then glued and driven together with



FIG. 21. USE OF SHOOTING BOARD IN PREPARING THIN BOARD FOR JOINTING

blows of the mallet, the joint being afterwards tightened up solidly by means of cramps and cleats. Much more pressure may be safely applied than in the case of the simple butt joint.

Dowelled joints for outside work should be put together with lead paint instead of glue.

Tongued and grooved joints

The commonly used forms of this joint are usually purchased in the form of matchboarding. Fig. 22 shows three forms of this joint—v-jointed matching, bead-jointed matching and a secret nailed flooring joint. Loose tongued joints are made by ploughing a groove in both edges and inserting a tongue made,

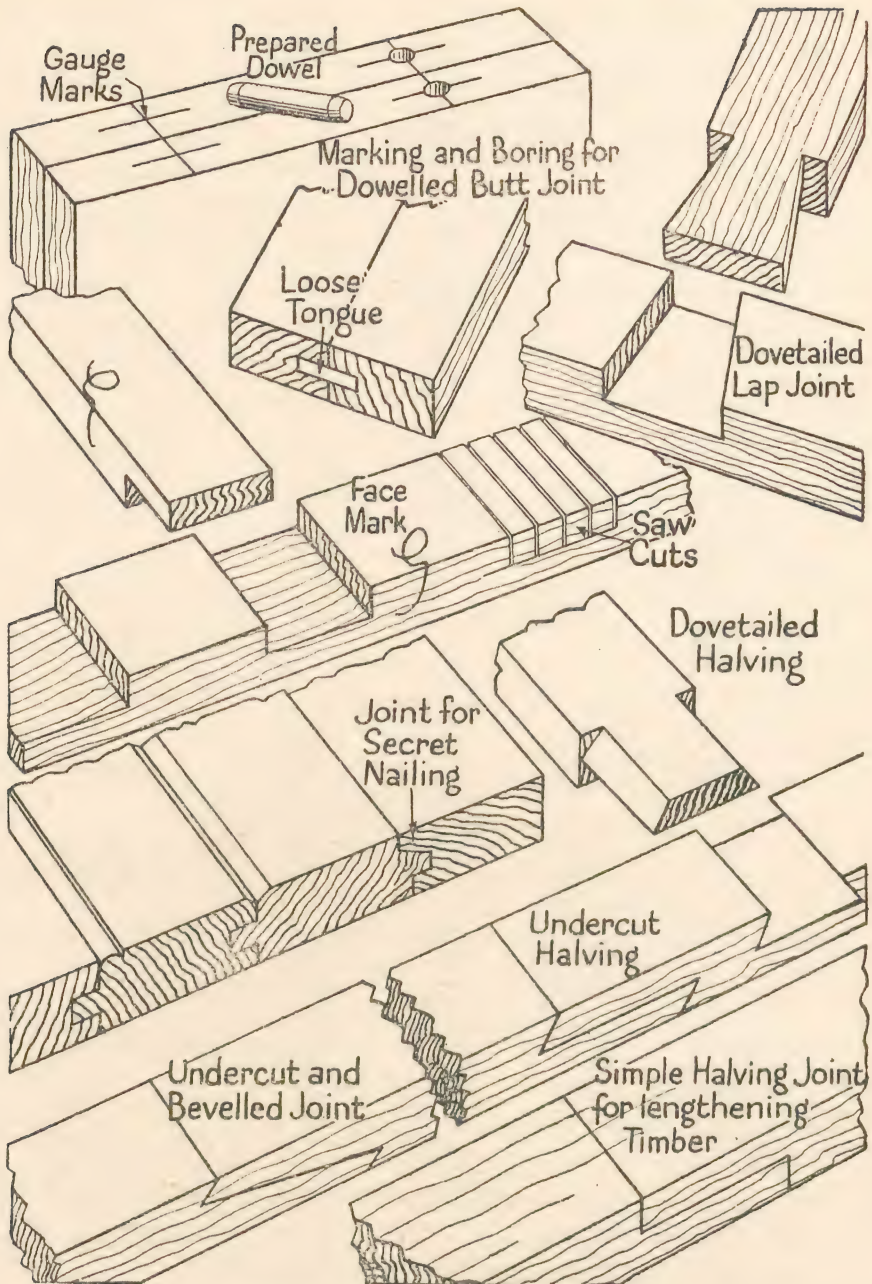


FIG. 22. SOME WOODWORK JOINTS

preferably, of 3-ply wood. If this tongue is well fitted, it provides a very strong joint and may be put together with paint for outside work.

The halved joint

This is the simplest of the structural woodwork joints and is much used in light framing, where it often takes the place of the mortice and tenon. The formation of the joint at the end of framing and at intermediate points as shown in the illustration.

When the joint occurs at the end of the framing, it is formed with the saw. It is important to remember that the saw cut must be made so that it is taken out of the waste side of the timber. Where the joint is cut at an intermediate point, the

Strip of Wood used
as guide when sawing
Housings

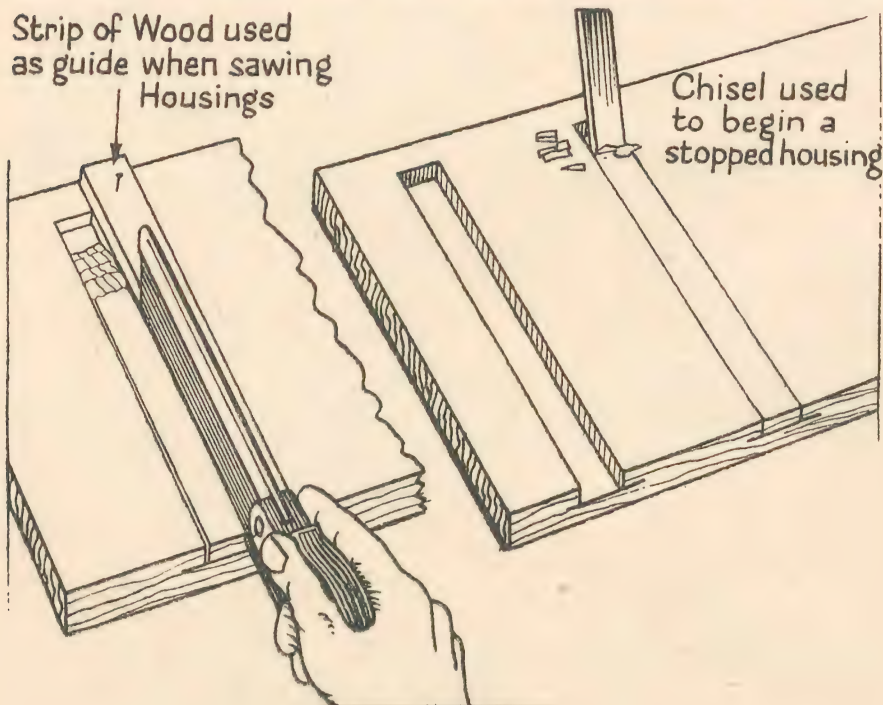


FIG. 23

waste is more easily removed if, before chiselling, two or three saw cuts are made as shown. The depth of the joint is marked with the gauge, and all gauging must be made from the face side. A typical face mark is shown, and all members of the framing should be so marked to prevent mistakes.

Two more variations of the joint are also shown. These are a little more difficult of execution, but in certain circumstances, where stain is anticipated in one direction or another, are well worth while.

The halving joint is also used to extend the length of timbers, and forms of this application of the joint are shown.

Housings

This joint is used in cases where the end of a board has to be let into the face of a supporting board. Examples are stair treads and book shelves. In the case of the through housing the groove is taken right through the width of the board. It is advisable to tack a fence across the board as a guide to the tenon saw as shown. The waste wood is then removed with the chisel, the final cleaning up being done by the router, the cutting iron of which is set to the exact depth of the housing.

In the case of book shelves and furniture framing, the housing is usually stopped about $\frac{1}{2}$ in. from the face edge and the shelf or rail notched to fit, so that the joint is invisible from the front. This is illustrated at Fig. 23. The stopped housing is chopped out with the mallet and chisel for the first 2 in. or so and then cut with the tenon saw in the same way as the through housing.

Mortice and tenon

In this very common joint, the centre third of one member is removed to form a hole or mortice, and the outside two-thirds of

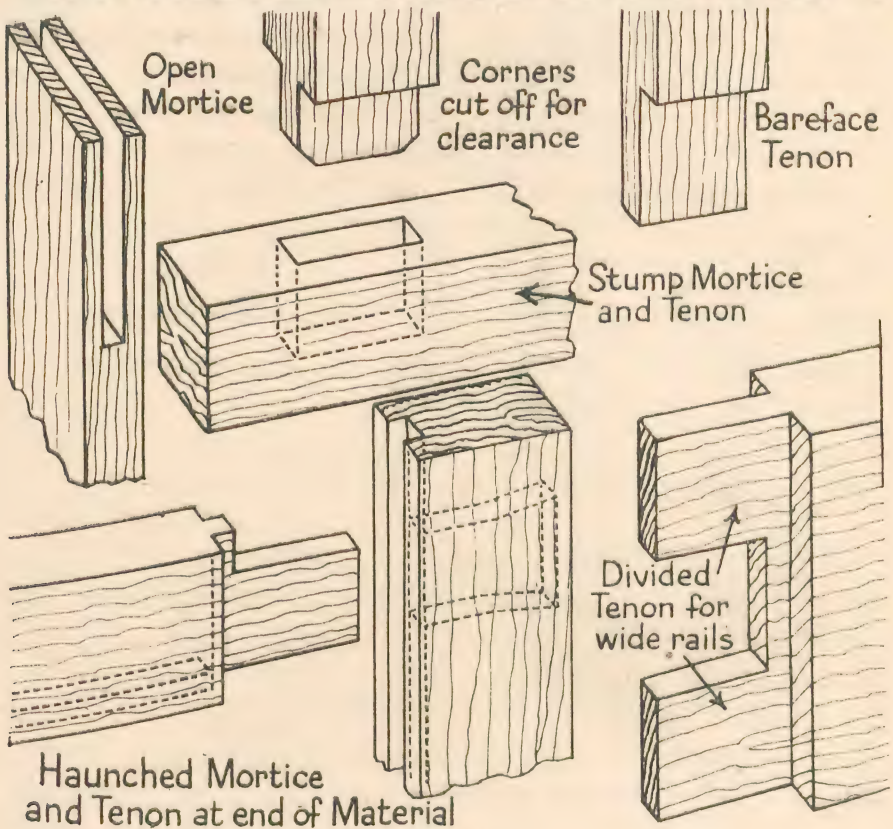


FIG. 24

the other member are removed to form a tenon. The simplest form of the joint is the stump tenon and mortice. A mortice, or

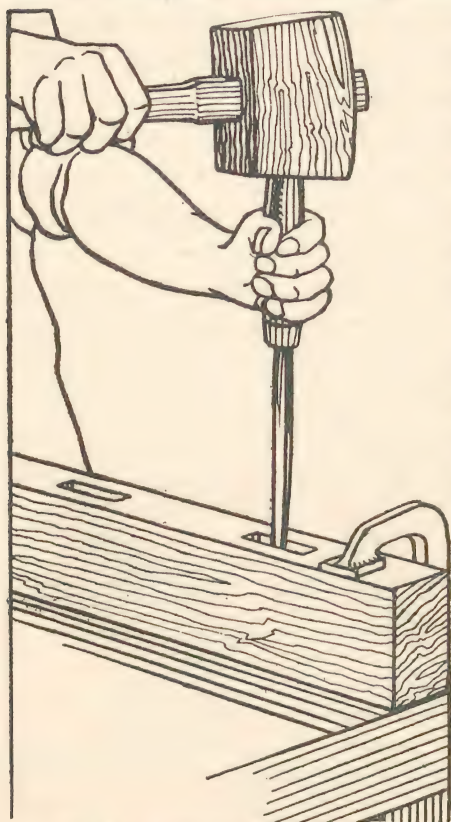


FIG. 25. MORTICE CHISEL IN USE

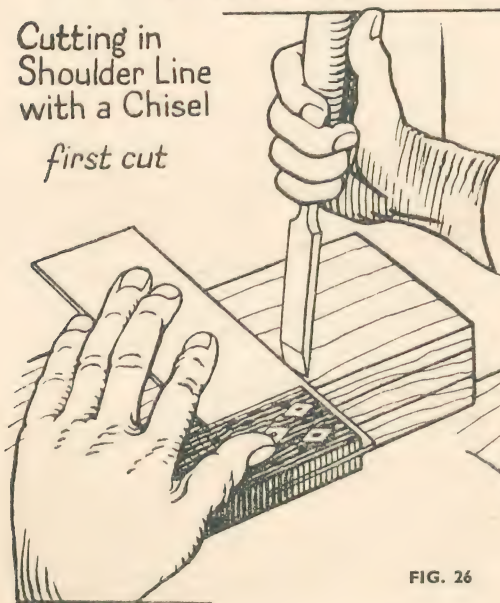
double-toothed gauge, is used by the craftsman to mark the thickness of the mortice and tenon, but a single-toothed marking gauge may be used, care being taken to gauge all the marks from the face side of the timber.

Cutting the mortice. As much as possible of the waste wood or core is removed by boring holes with a twist bit of suitable size. It is then chopped out with the mortice chisel, beginning at the centre and chopping back to each end. The sides of the mortice are then pared square and true with the paring chisel.

Preparing the tenon. The shoulders of the tenon are usually cut in with a marking

Cutting in
Shoulder Line
with a Chisel

first cut



Cutting
Shoulder Line

second cut

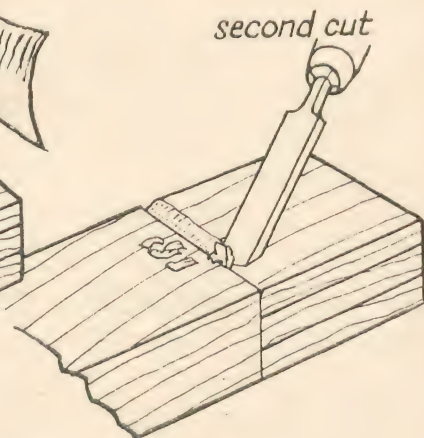


FIG. 26

knife or chisel in preference to a pencil, as this results not only in a finer line, but also provides a sharp edge. The craftsman often cuts away the first $\frac{1}{16}$ in. of the shoulder with the chisel as this makes an infallible guide to the tenon saw. This method is recommended to the amateur and is illustrated at Fig. 26. The shoulders being cut down to the gauge mark, the timber is fixed in the vice as shown in the illustration and the tenon cut down with the saw. The stub mortice and tenon is usually secured by wood dowels.

Wedging. In the more usual case, when the mortice is continued right through the timber, the joint is secured by wedging. Provision for the insertion of the wedge is made by increasing the length of the mortice on the outside.

Haunched mortice and tenon

Where a mortice and tenon joint occurs at the top or bottom of framing, a haunch is made so that the joint may be wedged. In the case of panelled framing the haunch is made the same depth as the groove for the panel. This is made clear in the illustration. In cases where the width of the timber which is to be tenoned is too great for a single tenon, the divided tenon is used.

Where the timber on which the tenon is formed is thinner than that which provides the mortice, a bare face tenon is often used. These are all shown at Fig. 24.

The common dovetail

Only the simplest form of this joint is described here, as it is considered that only the more experienced amateur will attempt the more advanced forms, and in the nature of things he will be provided with textbooks which will be more detailed than is possible in this section of a larger work.

The joint consists of sockets and pins broadly on the lines of the mortice and tenon already discussed.

Marking out the pins. It is considered simpler to form the pins first. The timber being prepared for width and thickness, it is cut off $\frac{1}{8}$ in. longer than the finished length. A fine gauge mark is then made right round the timber at each end. This gauge mark is made $\frac{1}{16}$ in. greater than the thickness of the

timber to be jointed. Thus if the timber is $\frac{1}{2}$ in. thick, the gauge will be set to $\frac{9}{16}$ in. The pins are then set out on the ends of the timber and squared over on the face. The slope, or bevel, of the dovetail should be quite gentle, and 80 degrees is considered the ideal. If an adjustable bevel is available, it should be set up to this angle.

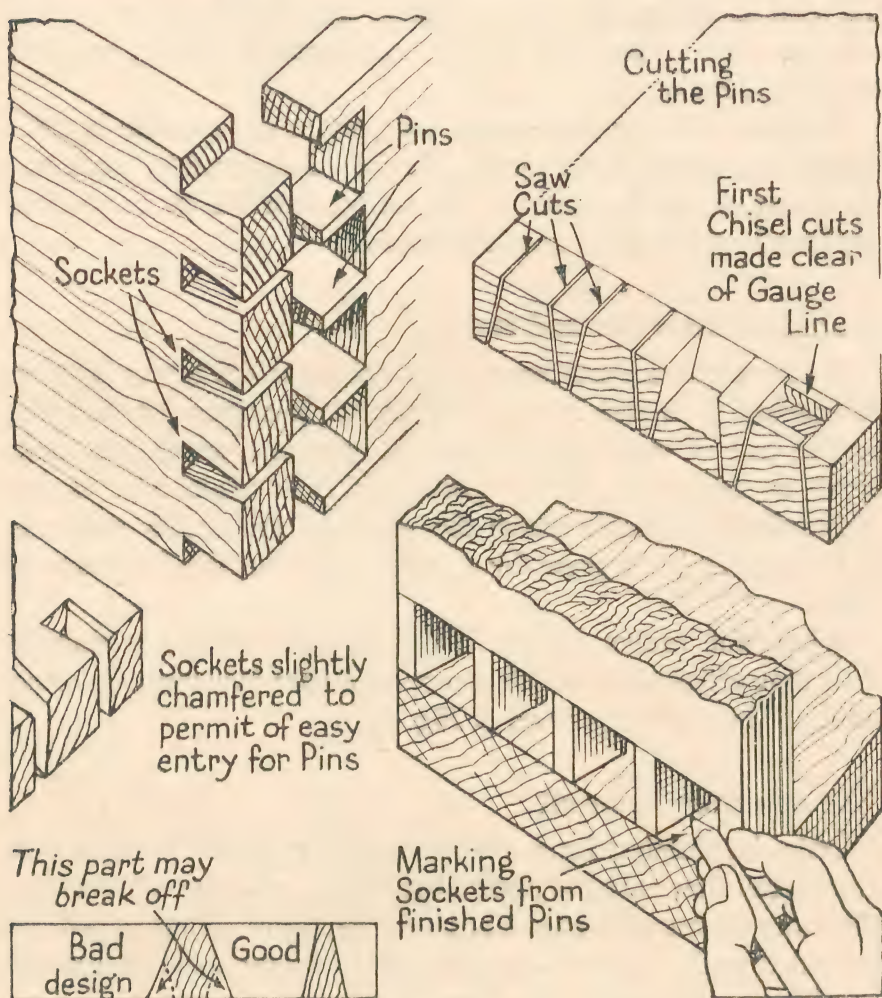


FIG. 27

Forming the pins. The timber is then fixed upright in the vice and the vertical cuts made with the tenon saw. The waste wood is then chipped out as shown in Fig. 28. The greater part of the waste may be removed by the use of the coping saw and the remainder chiselled carefully to the gauge mark.

Marking the sockets. The timber in which the sockets are to

be formed being cut to length and gauged in the same way as that for the pins, the latter is held perpendicularly and a fine pencil mark made round each of the pins in turn. These marks are squared over the ends of the timber.

Cutting the sockets. The saw cuts are made on the waste side of the line and the waste chopped out with a small chisel.

Assembling the joint. In soft wood the joint may be left quite tight, and after glueing may be driven home with the mallet. In hard wood, however, the sockets must be carefully pared so that the joint is hand-tight and the mallet used only for the final driving home.

In conclusion, it is suggested that the amateur, and especially the beginner, should practise these woodwork joints, particularly the mortice and tenon and dovetail, on spare pieces of wood in the same way as practice joints are made in a handicraft centre. The facility this gives will stand him in good stead when using them in actual construction and may avoid the waste of a valuable piece of timber later on.

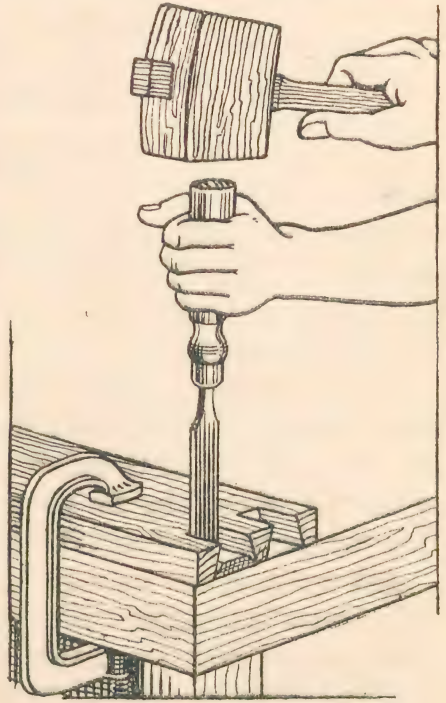


FIG. 28. CHOPPING WITH THE FIRMER CHISEL

CHAPTER XXXII

MATERIALS

TIMBER

Deal

Under this heading are grouped all the various timbers listed as "deal." They include types of fir, spruce, pine, as well as red, yellow and white deal, and an intimate knowledge of their various characteristics is quite unnecessary to the amateur. It is obvious, however, that a length of wood which may be quite good enough for a board in a fence may be quite useless as part of a book-shelf, and therefore it is necessary either to indicate at the time of ordering for what use the timber is required, or to visit the timber yard and choose the material personally.

Soft woods in this class are subject to various defects, such as large knots, bad edges, twists, shakes and malformations of the grain, and in addition, owing to faulty stacking or seasoning, may be twisted and bent. Some ingenuity is often required in selecting timber and marking it out for cutting so that the best use may be made of it. For example, a knot may often be cut out in process of making a joint, or a length of weak or damaged edge kept at the back of a rail or used as an interior member of a furniture carcase.

Oregon pine

This is now extensively used as a joinery timber for doors, sashes, etc., as well as for heavy constructional work. It is very free from defects, may be had in very large sizes and, stained and varnished, is quite decorative owing to its regular open grain.

Pitch pine

A very strong and resinous timber which is often cut so as to produce very lovely grain formations. It is widely used for furnishings, especially in public buildings. It looks well

varnished but should not be painted as the resin tends to work out and spoil the paint.

HARDWOODS

Oak

This favourite timber is used commercially in many varieties and is imported from many countries. English oak is a very fine timber but is exceedingly tough and hard to work. Many of the imported oaks are more suitable for the amateur, and the advice of the timber merchant should be sought when making a choice.

Mahogany

Once the favourite timber for furniture and ornamental purposes, generally it is now somewhat out of favour. Cuban mahogany, with its white flecks, and Honduras, which has a very beautiful grain, are the best known varieties, but many other hardwoods are often marketed as mahogany. It is not a difficult timber to work, but great care must be taken in preparing the finished surface for polish, as, in common with all fine-figured woods, the grain is liable to tear. Plane irons must be really sharp for cleaning up mahogany, and careful use of the scraper is essential.

Birch

This is much used in the making of plywood and for cheaper kinds of furniture. It is hard but fairly easy to prepare for polish.

Walnut

Black walnut and satin walnut are fine furniture timbers, the former being much to be preferred. It is often used as a veneer. American black walnut is fairly easy to use and is suitable for the amateur.

There are, of course, many other timbers, all with individual characteristics and uses, but the amateur will rarely come into contact with them unless he decides to make some study of timbers. It is a fascinating pursuit, and there are many excellent textbooks on the subject.

Plywood

The invention of plywood has profoundly influenced the design of joinery and furniture making. Whereas it was previously necessary to resort to jointing to achieve a width of board of anything much over 1 ft. wide, sheets of plywood may be had in almost any width. The formation of the product, in which layers of wood are glued together with the grain running at right angles in alternate layers, results in a very stiff board for its thickness, and one, moreover, not subject to appreciable shrinking or warping. Sheets of plywood are usually supplied in 5-ft. squares, but special sizes are made for various purposes. For instance, sheets about 7 ft. by 3 ft. are sold specially to cover flush doors. Thickness varies from $\frac{1}{16}$ in. or less in the case of plywood specially made for bending, to 1 in. or more, these latter being made up of 5 or 7 layers of wood.

Plywood is made in a number of woods, and for decorative purposes an outer skin of valuable wood is often glued to a core of a more common variety.

Plywood may also be had which is sheathed in metal, such as copper or stainless steel.

Laminated wood

This term refers to a type of manufactured board which is made up of outer skins, similar to plywood, but the core is made of strips of wood glued together and laid at right angles to the grain of the outer veneer. A very strong board results, and it may be purchased in thicknesses up to 2 in. and almost any length and width.

USE OF SECOND-HAND MATERIALS

When planning a piece of work and its cost, the amateur would be well advised to take into consideration the possibility of using second-hand materials. In most towns there are establishments which specialize in collecting and offering for sale second-hand timber and building materials of all kinds. These are a real happy hunting ground. Not only is the material cheap, but it is well seasoned, and a few shillings spent on old fittings from shops or public houses will often provide a stock of mahogany or oak which will fire the imagination of the woodworker as he visualizes the things he can make from it.

Most of the timber for the bench shown on p. 164, for instance, may be acquired in the form of old floor joists and second-hand boards, and the little extra cleaning up such materials demand is more than set-off by their cheapness.

MANUFACTURED WOOD PRODUCTS

The popularity of woodwork as a hobby has resulted in the manufacture and marketing of a great number of ready-machined items, from simple mouldings to complete pieces of furniture ready for assembly. Turned and moulded legs for tables and stools, table tops, embossed ornaments and so on abound in manufacturers' catalogues and are familiar to most woodworkers. It is intended here, however, to mention just a few of the lesser known items which may have escaped attention or which are novel in conception. Fig. 1, for instance, shows a cross-veneered rim for a circular table, and a leg which is fitted by simply screwing the square extension at the top of the leg to the inside of the rim.

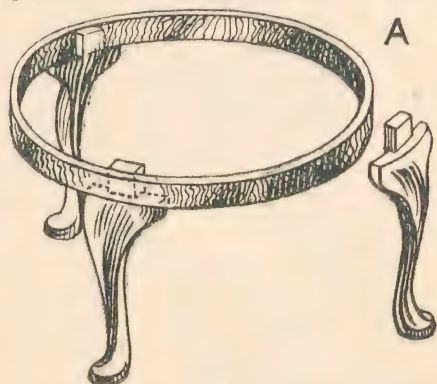


FIG. 1

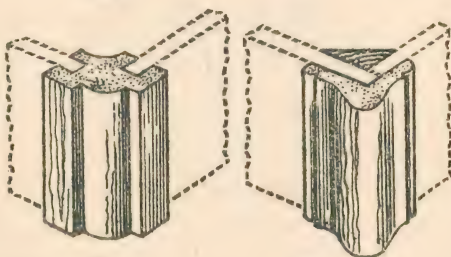
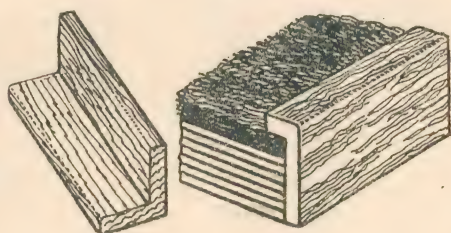


FIG. 2

At Fig. 2 is a group of designs for corner mouldings, the usefulness of which is obvious, and the rebated hardwood edging is used for covering the edges of plywood.

Fig. 3 shows a typical group of mouldings prepared for wall panelling.

Examples of mouldings

and plywood covered in chromium-plated metal are shown at Fig. 4.

Another ready-machined item is the tongued, grooved and face-grooved moulding at Fig. 5, specially made in teak for making up a draining board.

As a final example chosen from the almost bewildering array

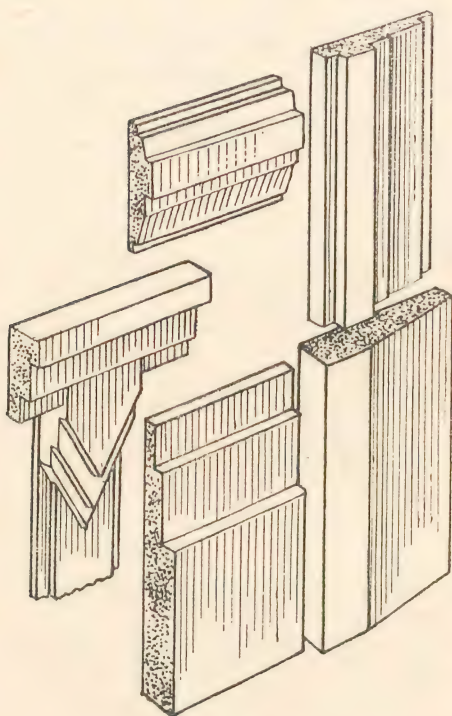


FIG. 3

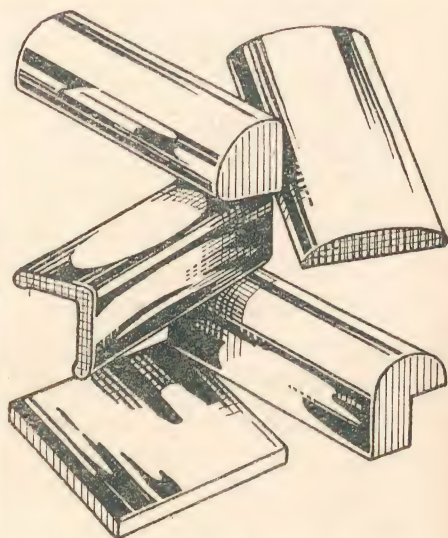


FIG. 4

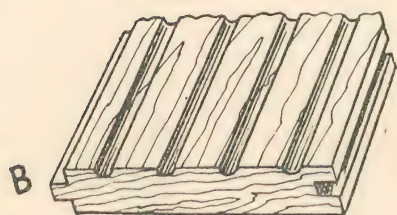


FIG. 5

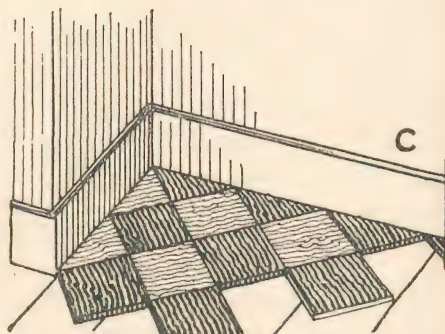


FIG. 6

of such prepared materials is shown ready-machined squares of oak for floor covering. Fig. 6.

While naturally the true woodworker would not wish, by purchasing complete pieces in machined parts, to avoid all the interesting processes in his adopted craft, yet many of the products of manufacturers specializing in machined wood cut out much of the drudgery previously inherent in it.

NAILS, SCREWS AND HINGES

The top line of the illustration (Fig. 7) shows the usual kinds of hammer-driven fixings. "A" is the oval wire nail, or oval brad as it is usually called. It is the favourite nail used in joinery, and the head is specially shaped so that it does not split the fibres of the wood and is small in section so that it is inconspicuous.

"B" is a round wire nail. Because of its round section and

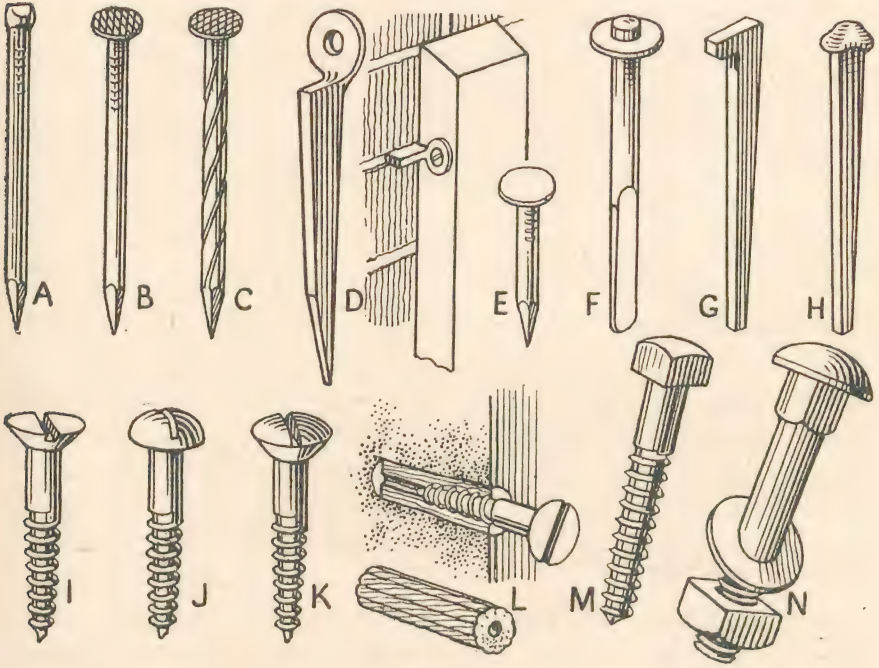


FIG. 7

broad head, it gives greater strength than the oval nail and is much used when appearance is not a consideration. Both these nails are supplied in sizes from $\frac{1}{2}$ in. to 6 in.

"C" is a screw nail. It twists as it is driven home and obtains a very strong grip in such materials as soft bricks or coke breeze blocks.

The Holdfast "D" is driven into the joints of brickwork as shown and is invaluable for fixing posts or framing which abut on to a brick wall. Holdfasts are sold in several lengths, but 4 in. or 5 in. is the most useful.

The clout nail, "E," is used where a very large head is required in fixing materials which would tend to tear or pull through if a

small-headed nail were used. Hence it is a favourite for fixing roofing felt or for nailing sash cords to the grooves in the edges of sashes. The usual sizes are $\frac{1}{2}$ in., $\frac{3}{4}$ in. and 1 in., and clout nails are galvanized for outside work.

"F" is strictly speaking not a carpenter's nail at all, but may have to be used by the amateur in his jobs about the house. It is a pipe nail and is used almost exclusively in fixing rainwater pipes to the house wall. It is usually driven into a mortar joint or a wood plug in the brickwork.

The floor brad, "G," as its name implies, is used for fixing down floorboards. It is also known as a cut nail and is usually supplied in $2\frac{1}{2}$ in. and 3 in. sizes.

The wrought nail, "H," sometimes mistakenly referred to as a cut nail, is used when great strength is needed. It is sold in all sizes from 1 in. to 6 in.

A small stock of the more usual sizes of "A", "B" and "H" should be purchased by the amateur, and the more special nails listed may be bought as required for a particular job.

Two more types of nails should be mentioned, panel pins and veneer pins. These are very fine gauge nails, especially the veneer pins, and an ounce or two of each, in say $\frac{3}{4}$ in. and $1\frac{1}{4}$ in. sizes, will be found a most useful store.

Screws and bolts

Screws are made in lengths from $\frac{1}{4}$ in. to 6 in., and the thickness varies in gauge by numbers from 0 to 24. They are made in a variety of metals for various purposes, and some are plated, or bronzed, or given other decorative finishes. Iron and brass are, however, the more usual metals, and indeed for the amateur a small stock of iron screws only should be obtained and other screws bought as the need for them arises. It will be found that, out of a dozen screws bought for a particular job, one or two will be left over, and in a very short time quite a collection of odd screws will be acquired in this way. These kept in a box will form a most valuable "treasure chest" in which to rummage.

The countersunk head screw, "I," is the most common type of screw in use. By the use of the countersink bit a depression is formed in the wood, into which the head of the screw is sunk. The screw may be driven so that its head remains flush with the

surface, or it may be sunk below the surface so that the hole may be stopped and thus made invisible. Countersunk screws are sometimes fixed in such a position that their removal and replacement may often be necessary, such as in the case of an inspection cover over pipes or wiring. In this case the screw is provided with a countersunk brass cup, which is driven in place before the screw is fixed, thus avoiding damage to the woodwork surrounding the screw hole.

“J” and “K” are round head and raised head screws, and are used in fixing metal fittings when the head of the screw remains above the surface.

Fixing by screws to brick, stone, etc.

Until quite recent times, the use of the wood plug for fixing of this nature was universal, and in the main quite efficient. It involved, however, some skill on the part of the worker and demanded seasoned wood for plugs to avoid shrinking and loosening, and was in general a source of trouble to the amateur.

All these difficulties are now, however, smoothed away with the introduction of the patent plug. “L” shows an example of a well-known make of plug which, introduced into a hole drilled by a special tool, gives a secure grip in almost any material. Outfits suitable for use in the home, containing drills and plugs of several useful sizes, are available and should form part of every amateur’s tool kit.

There are a number of varieties of patent plugs, and in addition a plastic compound which is used to fill up a hole or cavity, and which, when set, affords an excellent grip for screws.

“M” is a coach screw, which is used instead of a slot driven screw for heavy constructional work. Useful for such tasks as fixing a splint to a broken fence post, or securing the corner posts of garden sheds, it is turned in by a spanner after the same preparation as for an ordinary screw.

The last example shows a bolt, nut and washer. These are made in many lengths and thicknesses and with several shapes of head. The bolt shown is the usual kind used for constructional woodwork. The square on the shank immediately under the head prevents the bolt from turning while the nut is tightened. Washers are used under the nut to prevent bruising and to provide a bearing surface.

Common types of hinges

Among the fittings the amateur may be called upon to deal with are hinges. The illustration (Fig. 8) shows four types.

"A" is an ordinary butt hinge as used on room and cupboard doors. The two main varieties are cast and pressed butts. The former, being more robust, are used mainly on the heavier exterior doors, while the lighter pressed butts serve for interior doors.

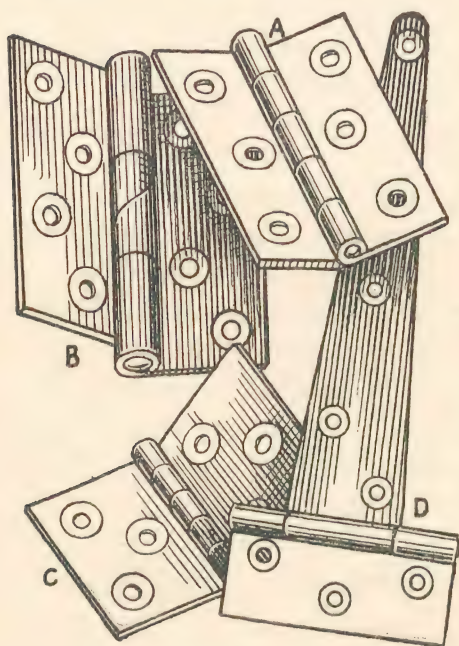


FIG. 8

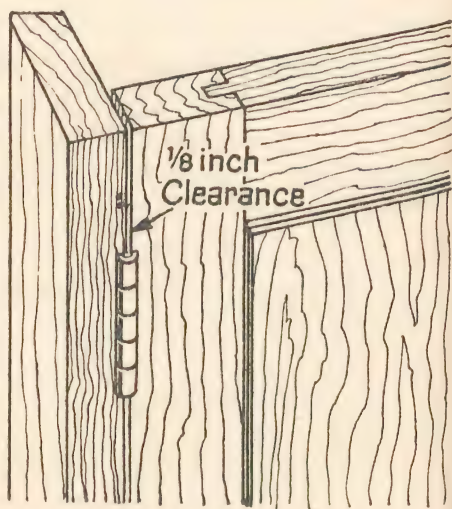


FIG. 9

Hinges used for cabinet work are similar in construction, but the wings (the parts drilled for screws) are narrower in proportion to the length of the hinge and they are normally made of brass.

It is the usual practice for both wings to be let into the wood, one into the door and the other into the frame, though there are exceptions to this rule. The mistake most often made by the amateur lies in assuming that the thickness of the wings is automatically the depth to which the woodwork must be recessed. This is not always so. The best method of ascertaining the correct depth of the recess in the case of cast butts is as follows: The hinge is closed and the width of the knuckle, or rounded part of the hinge, measured. Assuming that this width is

$\frac{5}{16}$ in., and it is desired to allow $\frac{1}{8}$ in. of clearance or joint at the door edge, the $\frac{1}{8}$ in. is subtracted from the width of the knuckle ($\frac{5}{16}$ in.) and the result ($\frac{3}{16}$ in.) is the depth of both recesses. Therefore each wing is recessed $\frac{3}{32}$ in., or, as the joiner prefers to call it, $\frac{1}{8}$ in. full. Fig. 9 shows clearly why the clearance between door and frame has to be subtracted from the width of the hinge knuckle.

At "B," Fig. 8, is shown a rising butt hinge. In this type the bearing surface of the knuckle is so shaped that, as the door opens, it is raised so as to clear the floor covering of the room. It is unlikely that the amateur will have to hang a door on rising butts, but the replacement of a broken hinge may at times be necessary.

The hinge with the long wing, or strap, is a cross garnet, much used on light doors made of tongued and grooved timber such as shed doors, etc. Its fitting is simplicity itself, the hinge being merely screwed on the face of the door and frame. They may be bought in a wide range of sizes, and the strap or wing should be at least two-thirds as long as the width of the door to which it is fitted.

The fourth item in the illustration is a back flap hinge. It is so made as to open almost full circle. It is often used on light doors and on hingeing the back frame on pairs of steps.

There are, of course, other types of hinges, and the ironmongers' catalogues list many thousands of other fittings of all kinds for many purposes. It is suggested that the amateur might obtain a copy of the general catalogue of a good wholesale ironmonger. A study of this will often solve the problem of the correct fitting to purchase and fit for a particular job. An experienced assistant at a good class shop is, too, a mine of information and is usually willing to help the amateur in his search for a particular item.

CHAPTER XXXIII

THE AMATEUR CARPENTER'S WORKSHOP AND ITS EQUIPMENT

While many odd jobs and emergency repairs may be undertaken without any special accommodation in the form of a workshop, such a provision is a real necessity for the man who intends to take his home craftsmanship seriously. It is often impossible to start and finish a particular task in one session, and the nuisance and waste of time involved in packing away tools and materials and getting them out again for each fresh start are a fruitful cause of procrastination and, indeed, often result in the task being given up in despair. When a workshop is available everything may be left ready for re-starting and many odd hours are utilized which would otherwise be wasted. If possible a spare room, such as a small bedroom, should be fitted up as a workshop, but many home craftsmen will be forced to erect a shed for the purpose.

However located, certain considerations must be borne in mind. It must be dry and warm. Tools left in a damp atmosphere will be covered in a film of rust in a matter of hours. Glue will chill and become useless in a few seconds if the workshop is cold. Most important of all, unless the worker is comfortable the work will give no pleasure.

If a workshop is to be built, let the walls be stout and weather-proof and the roof soundly constructed and adequately covered. Let there be plenty of windows, and provision for heating and lighting in the winter, and let there be a good dry path by which the workshop may be reached on winter nights. The ready framed portable buildings which are bought in sections are rarely satisfactory for this purpose as they are far too flimsy in construction. Robust buildings are to be obtained, some of them made of cedar which is very durable and needs no painting, but these are usually quite expensive and the amateur will be able to build his own workshop to his own design at less cost.

With the help of an experienced friend during the planning

and initial stages of building, a brick-built workshop is well within the scope of the keen amateur. It is often possible to purchase quantities of second-hand bricks, tiles, and other building materials, and this is dealt with in the article on Materials in this section. Plans would have to be drawn and submitted to the local authority and a table of quantities drawn up, but the difficulties are not insurmountable, and a draughtsman friend or an architect will prepare drawings from the amateur's rough sketches for a modest fee. There are few more satisfactory experiences than the erection of a good-looking substantial workshop, and the existence of this permanent monument to one's skill and determination will do much to encourage and confirm the amateur in his choice of this fascinating hobby. Much valuable information and help may be had from a careful study of other Sections of this work, which will be found to cover every aspect of the work involved.

If possible the workshop should be connected to the electricity service of the house. Good light is most essential, and also a small portable heater could be used. A small electric hot plate would be useful for the heating of glue. Gas rings or oil stoves, if used, should be carefully safeguarded, and in many ways it would be better to use electricity for all purposes. Shelving of 9 in. by 1 in. timber should be fitted at convenient points, and a rack for timber may be constructed in the roof. The door opening should be not less than 2 ft. 6 in. wide, as quite large framings for furniture, etc., will have to be moved through it.

Fitting up the workshop

The bench

The composite drawing (Fig. 1) shows a useful type of bench, together with other necessary equipment. Robustness is the essential quality for the carpenter's bench, and this is found in the example illustrated. It should be at least 8 ft. long, and 2 ft. 6 in. is the normal height. The uprights of the leg framings are of 6-in. by 3-in. timber, and the rails, which are tenoned into them, are of 3-in. by 3-in. The front board of the bench top is of 9-in. by 2-in. This must be a straight true board. The slightest tendency to roundness or hollowness in its length or width will cause trouble every time a piece of timber is laid on it to be worked.

It should be mentioned here that, as the bench will no doubt be used for other purposes than joinery from time to time, another board should be prepared which can be laid on top when, for instance, soldering or paint mixing is to be done. This will protect the real bench top from the paint and grease, and no chips or filings of metal will lodge in the wood to spoil chisels or plane irons.

The bench stop. This consists of a short length of hardwood which is tightly fitted in a mortice in the front board as shown.

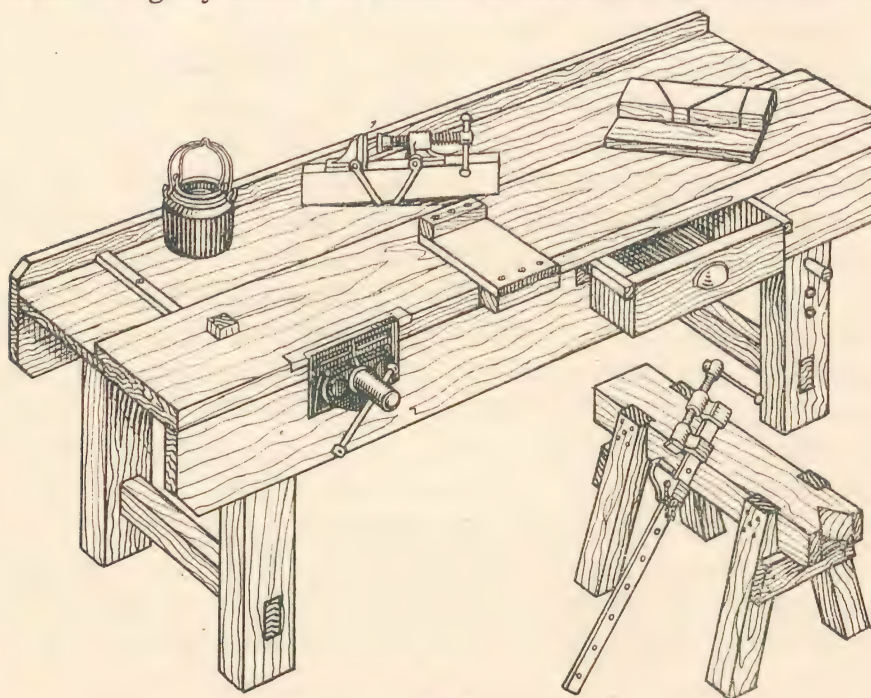


FIG. 1

Its height above the bench top is adjusted by a tap of the mallet. If necessary, a thin wedge may be fitted for adjustment if wear causes it to become slack in the mortice. Patent bench stops of various kinds may also be purchased if desired.

The recess, or well, of the bench is formed of a 9-in. by 1-in. or 1¼-in. board, and a narrow fillet of wood about 1 in. by ½ in. is fixed across it opposite the bench stop. The worker should form the habit of laying down his planes with the nose resting on this fillet, thus keeping the protruding plane iron clear of the bench and possible injury.

The back board is of similar size to that forming the well and extends above the bench top so that its top edge is level with the

front board. Thus framing laid across the bench for cramping and glueing is on a level plane.

The face board, in which is fitted a tool drawer, is of 9 in. by 1½ in. The carcase of the tool drawer is made up of 1-in. timber

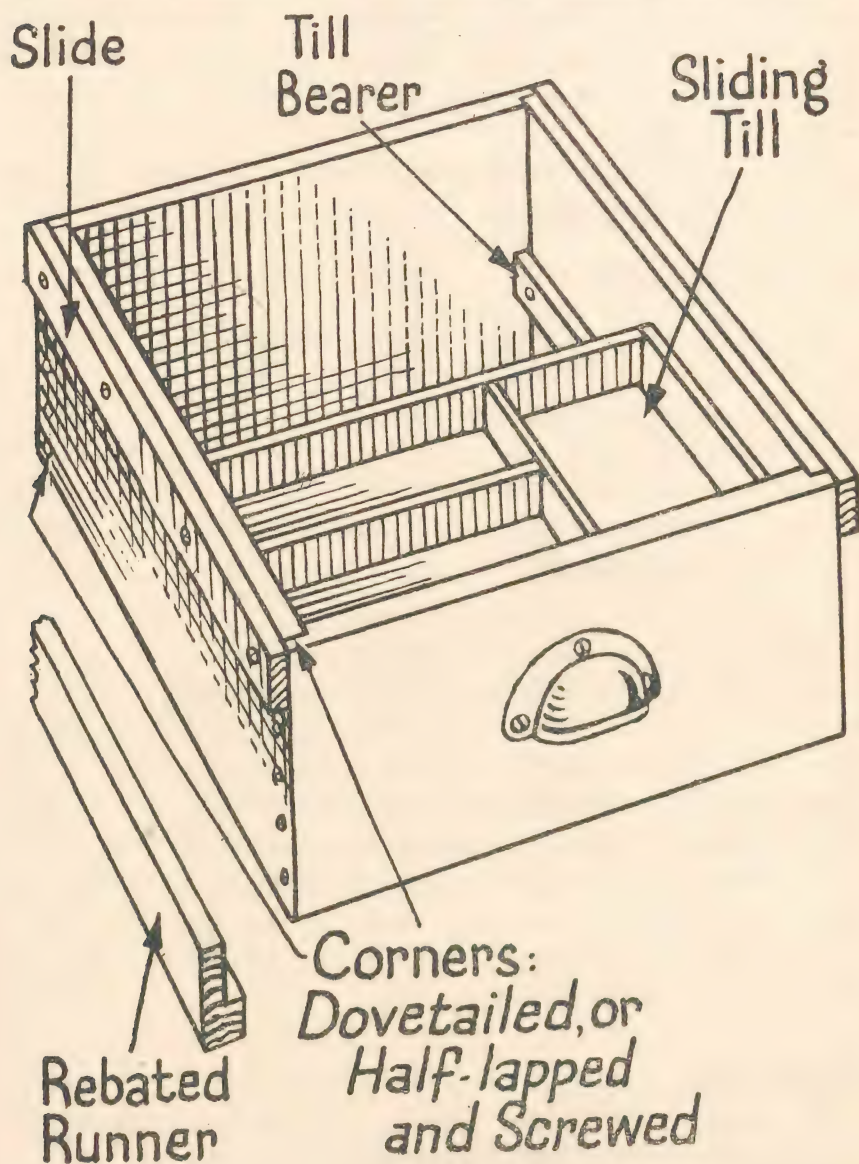


FIG. 2

and has a plywood bottom. The runners are of oak or birch and slide into solid rebated timbers screwed up to the underside of the bench top (Fig. 2). It should be fitted with a till tray as shown.

The type of vice shown has 8-in. jaws, and the edge of the bench top opposite the vice may with advantage be reinforced by a strip of oak or other hardwood. A wood peg is shown fitted to a hole in the rear leg of the bench. Its purpose is to afford support to the ends of long lengths of timber held in the bench for planing, etc., and a series of three holes at different heights will enable the worker to adjust the peg for different widths of boards.

Three or four light boards may be fixed, if desired, under the bench supported by the rails of the legs to form a useful shelf.

The sawing stool

The construction of this item is clearly shown in the drawing. In this case the legs are of 3 in. by 3 in. and the top of 4 in. by 3 in. A somewhat lighter stool may be made, using 4 in. by 2 in. for both legs and top. Braces of 4 in. by 1 in. or $1\frac{1}{4}$ in. are needed to the legs at either end and a V notch cut in one end of the top so that, when ripping a board, the saw may be allowed to cut right up to the stool without damaging it.

Cramps

Shown lying against the stool is a 3-ft. sash cramp. This is a useful size for these light cramps, and if possible two should be provided. On the bench is shown a pair of cramp heads. These may be fixed to a board, thus converting it into a cramp of any desired length. Another common type of these cramp heads is fitted with steel pins which engage in holes bored in the timber at convenient spacings. G cramps are shown in several of the illustrations to this section, and may be had in sizes from 4 in. to 12 in. 8 in. is a useful size.

Bench hook

An easily made gadget, much used when cutting in the shoulders of tenons or cross-cutting with the tenon saw.

Mitre block

The block shown is made so that mitres may be cut on either end of the wood, and also a square cut is incorporated. It may be made by rebating a solid piece of wood, say 4 in. by 2 in., or

may be built up of two pieces glued and screwed together. A mitre block should not be retained in use after it has lost its accuracy owing to wear in the cuts, but a new one should be made, or if space permits, new cuts made in the old block.

The same saw should be used throughout the whole life of the block. Using a thin saw in the cut made by a larger saw with a thicker blade leads not only to inaccuracy in the cut, but to spoiling the block for the original saw.

Glue

The glue pot shown in the illustration is the normal type with the inner pot which contains the glue contained in an outer pot containing water. The alternative merits of glue made in a pot such as this, and the patent glues bought ready made in tins, are often debated. Sufficient to say that both, properly used, are efficient, and the worker may set off the extra cost of the patent glue against its greater convenience and make his own choice.

The rules for preparing glue in an ordinary glue pot are few and simple. The glue is bought in the form of a hard cake. This should be broken up in small pieces by wrapping it in a piece of clean rag and beating it with a hammer. Cake glue is very brittle, and were it not wrapped before being broken up it would fly about all over the place. The broken glue is now placed in the glue container, covered with cold water, and allowed to stand for some hours or overnight. The glue being thoroughly soaked, water is put into the outer container or water jacket, and the glue pot put on to heat up. When the glue has thoroughly melted it should be tested for thickness. It should run off the end of a stick or brush dipped in the glue without dripping off in drops. Hot water should be added if the glue is too thick. This test is in fact a matter of practice, and one of the many points in the craft of woodwork which experience will teach.

Care should be taken to make sure that the water jacket is not allowed to boil dry, or the glue will burn and become useless. It is unwise for the amateur to buy too large a pot as glue may only be heated up three or four times before it darkens in colour and begins to lose its strength. This darkening of the colour is important if the glue is to be used for joints in white wood.

It follows, therefore, that a small pot which is often replenished with new glue is much better than a large pot which is heated a great number of times.

Glue should be used when it is very hot, and the temperature of the workshop should not be cold or even the hottest glue will chill while being applied to the timber and become useless.

There are a great number of patent glues on the market, including powder and cold water glues, and the assistant at a

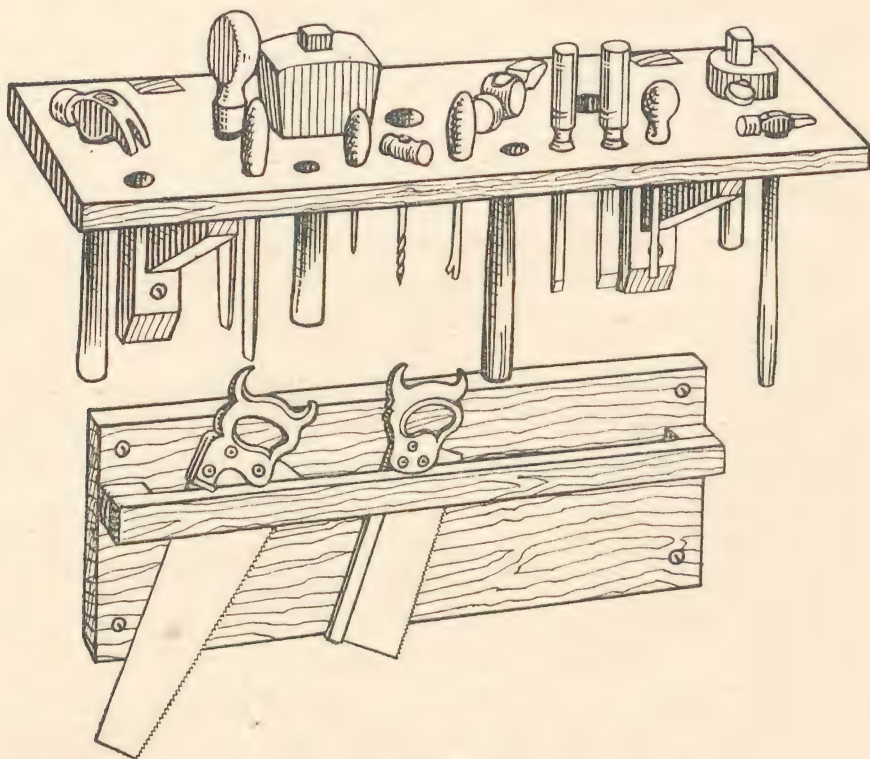


FIG. 3

reputable dealers may be relied upon to guide the beginner to a suitable choice for a particular purpose.

Finally, it is important to stress the need for tidiness in the workshop. Shavings and chips should be regularly swept up and burnt, tool racks fitted and the tools kept in them as shown in Fig. 3, and arrangements made for storing nails, screws, etc. A row of screw-topped glass jars is the ideal storage for small quantities of nails and screws as their size and the number in stock may be seen at a glance.

CHAPTER XXXIV

BUILT-IN FURNITURE AND FITTINGS

The great enlargement of the owner-occupier class which occurred between the wars, and which shows every sign of continued increase in post-war years, has resulted in a change of outlook in regard to furnishing. When almost every house was rented, all the furniture, with the exception of a built-in cupboard or two or a row of shelving, was portable and carried from house to house by the tenant. The owner occupier, on the other hand, will find it much more convenient to have large items, such as wardrobes, sideboards, book-shelves, etc., built into the fabric of the house.

This tendency is now recognized by the manufacturers, and standardized sets of fitments are produced ready to be "built in" during the construction of the house which is intended for sale. The owner who is also an amateur carpenter will find a fascinating outlet for his talents in this direction, more especially as plywoods, laminated and building boards, and other modern materials lend themselves to this class of work.

The movement away from highly polished hardwoods to softwoods and plywoods in large plain surfaces, often painted or cellulosed and devoid of ornament, enables the amateur to produce most attractive additions to his home even though he possesses the minimum of technical skill. In this chapter it is intended to suggest designs and ideas for built-in furniture of a simple kind.

USING THE RECESS BY THE FIREPLACE

This is perhaps the most convenient place in the ordinary house for a built-in feature, and it is proposed to show three alternative methods of utilizing it, one for the kitchen-living-room, one for the lounge and one for the bedroom.

At Fig. 1 is shown a very useful arrangement for the bedroom. It consists of twin wardrobes occupying the recesses on

either side of the fireplace. A suggested layout for the interior fitting is shown, and this is suitable for both ladies' and gentlemen's wardrobes. This layout may, however, be easily adapted to suit individual tastes or needs.

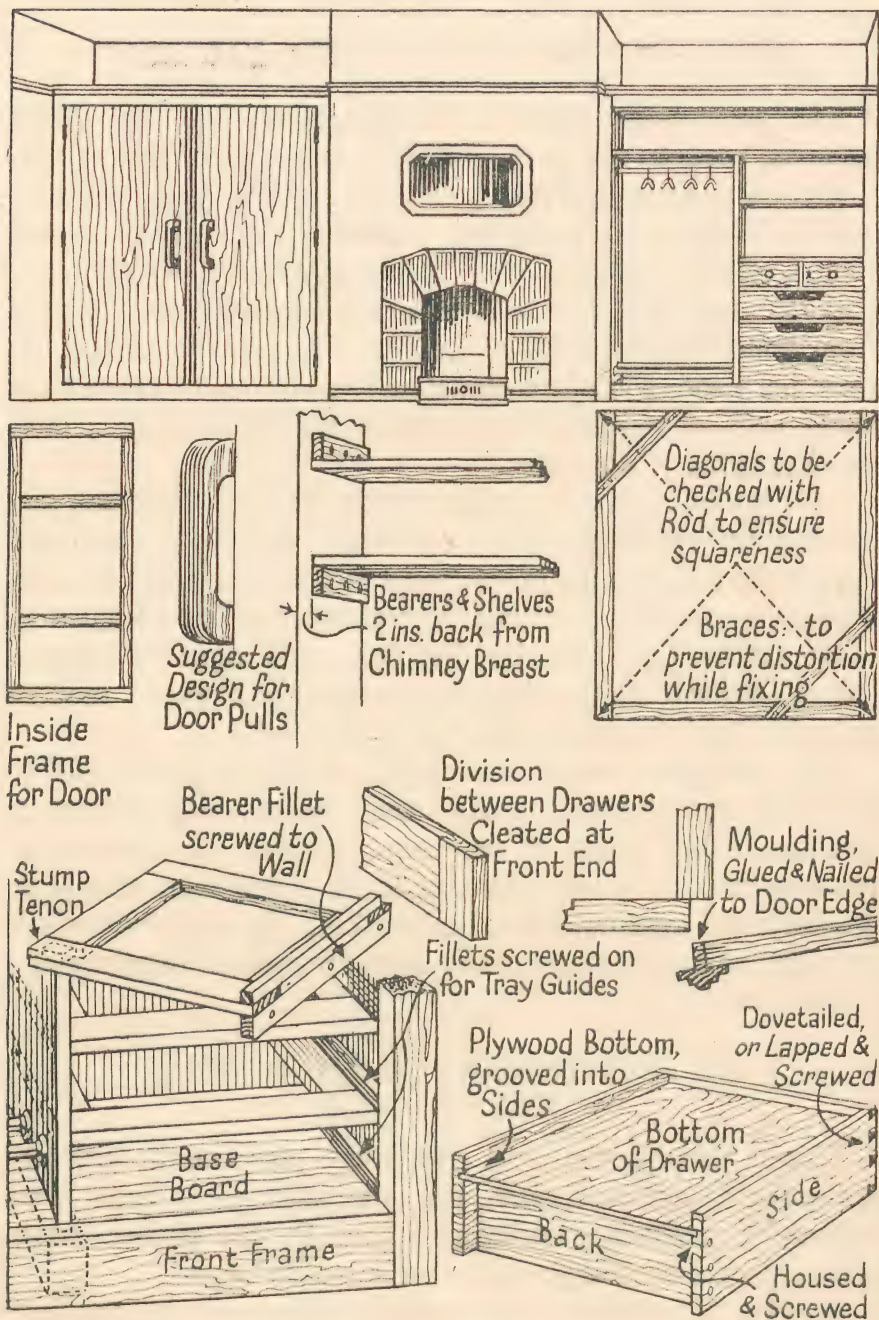


FIG. 1

The wardrobes are built up to the height of the picture rail, but where preferred, may be continued to ceiling height and the extra storage space thus provided enclosed by a pair of cupboard doors to match the doors of the wardrobes. The depth of the fitting is about 1 in. less than that of the recess. Very few plastered walls are exactly straight and plumb, so if the front members of the framework were flush to the chimney breast, small discrepancies would be revealed and it is therefore better to allow the face of the wardrobes to be approximately 1 in. back from the line of the breast.

The front frame consists of top and bottom rails and a pair of stiles (uprights) all cut from 1-in. prepared timber giving a finished thickness of $\frac{7}{8}$ in. The stiles should be $1\frac{1}{2}$ –2 in. in width and the rails 4 in.

The frame may be stump mortice and tenoned, or half-lapped and screwed. The three shelves which span the full width of the wardrobe, should be butt-jointed out of 1-in. prepared timber, as also should the upright centre division. This latter is stop-housed into the shelves.

It should be noted that all joints mentioned in this section will be found in the article on woodwork joints.

The half-width shelves are also solid and butt-jointed, but those which support the drawers and trays, are simple frames made out of $2\frac{1}{2}$ -in. by 1-in. timber and stump-morticed and tenoned at the corners as shown in the diagram.

All frames and shelves that abut on the wall surface of the recess are supported on 2-in. by 1-in. fillets as shown, and these are screwed to the wall, using Rawlplugs and 2-in. by 12-in. screws. This obviates the need for solid sides to the wardrobe.

The interior ends of these shelves and frames should be stop-housed into the centre upright partition, but as a possible alternative they may be merely screwed through the partition, four $1\frac{1}{2}$ -in. No. 10 screws being used for the purpose.

The bottom shelf is supported by three lengths of 3-in. by 2-in. timber set on edge as shown. This shelf, being mounted on these, will then finish flush with the top edge of the bottom rail of the front frame. The length of these 3-in. by 2-in. bearers should be 2 in. shorter than the depth of the recess, and this measurement is also the width of all the shelves and frames,

so that the front frame, when fixed, will be about 1 in. back from the face of the chimney breast as stated.

The coat hook rail, and the rails for the shoe rack, are made of $\frac{3}{4}$ -in. dowel rod, and are supported at each end on circular or square brackets made out of $\frac{1}{2}$ -in. timber. These brackets should be of oak or other hardwood.

The construction of the drawers and trays is clearly shown in the diagram. If the worker does not possess a plough with which to make the groove for the plywood bottom, this may be supported on a fillet of hardwood $\frac{1}{2}$ in. by $\frac{1}{2}$ in. glued to the bottom of the drawer sides. The guides for the drawers are also of $\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. hardwood and are glued and screwed to the shelves and bearing frames as shown. These are obviously only needed at the wall ends of the frames and shelves, as the centre upright partition forms the guide at the interior end.

Method of erection. The solid shelves being jointed and the housing for the shelves cut and the frames prepared, it should first be ascertained that the floor of the recess is quite level; if it is, then the distances of the shelves may be measured up the walls and the fillets screwed in position. If the floor is out of level, the bearers for the bottom shelf will need to be so adjusted that the shelf shall be level when fitted. If, for instance, the floor is $\frac{1}{2}$ in. out of level, then one bearer will be $2\frac{1}{2}$ in. high, one about $2\frac{3}{4}$ in. and the last will remain its full height of 3 in. The bottom shelf should then be fitted and fixed and all measurements up the walls taken from it.

The wall fillets being fixed and the bottom shelf being in position, the rest of the carcass members are fitted. Shelves, etc., resting on wall fillets are fixed by three $1\frac{1}{2}$ -in. No. 10 screws in each.

The division between the drawers is formed of one piece of 1-in. prepared timber with a cleat tongued and glued on the front end as shown. This need not be housed into the adjacent shelves, but may be screwed in position.

The front frame is now fixed in position, oval wire nails being used and punched below the surface so that the holes may be stopped with putty or plastic wood afterwards. Great care must be taken to ensure that this frame is exactly square, or trouble will ensue when hanging the doors. One infallible method of testing such a frame for squareness is to prepare a

thin lath of wood about a foot longer than the diagonal size of the frame. The joints of the frame being fitted, the lath is used to test the frame by measuring with it each diagonal in turn, moving the frame one way or the other until the diagonal size both ways is exactly the same, when the frame joints are finally fixed by screws. To prevent the frame being knocked or racked out of square while it is being fixed, one or two braces are nailed to it in the manner shown in the diagram. The picture rail, previously removed from the walls of the recess, is then fitted to the top rail of the front frame.

The doors. The simplest way of making these is to prepare a frame out of 2-in. by 1-in. wood and to cover both sides with sheets of plywood. The frame may be half-lapped, or mortice and tenoned, but the greatest care must be used in making the joints, to ensure that the frame is quite flat, with no suspicion of twist. The plywood, too, must be without twist.

In place of the framed doors, doors made of laminated, ply- or block-board may be used. These materials are described on p. 154 in the chapter on timber, and are quite without twist or distortion.

If it is proposed to paint the wardrobes to match the paint in the rooms, birch or alder ply may be used for the doors and good class deal for the front frame. If, however, they are to be stained and polished, the frame should be in oak or other hardwood and plywood faced with the same timber used for the doors.

When hung, the doors will close on the centre upright division, and a moulding, which may be bought ready-made, provides a rebate as shown. A suggested design for the door pulls is also shown. These may be formed out of 1-in. hardwood and screwed through from the back of the door.

Cupboard for the dining-living room (Fig. 2)

This consists of a lower cupboard, two useful drawers and a display cabinet or china cupboard with imitation lead-light doors. Unlike the wardrobes dealt with in the last article, the shelves of this fitment are housed into side members instead of being fixed to fillets in the walls. The doors of both cupboards are hinged to these side members and so there is no need for a

front frame. The design shows three shelves in the upper cupboard and one in the lower, but this arrangement can be varied as desired.

The work commences with the preparation of the side

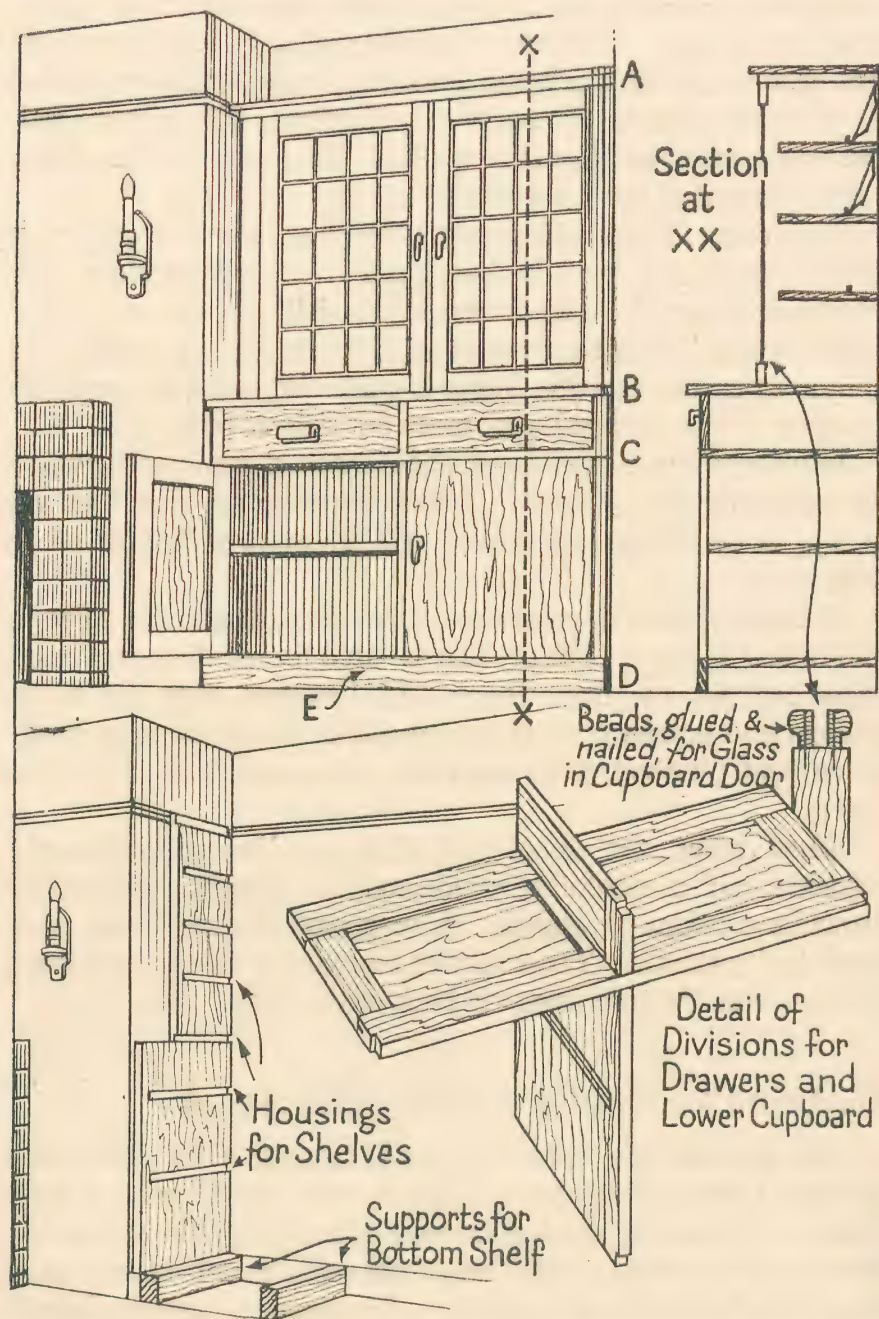


FIG. 2

members of the carcass on the bench. All the members are of 1-in. prepared timber, butt-jointed where necessary. The greatest width of the sides is the depth of the recess less about 1 in., and the depth of the upper cupboard about 4 in. to 6 in. less than that of the lower cupboard and drawers according to the space available. In cases where the recess is exceptionally shallow it is permissible to allow the lower section to stand forward and the upper section to be the full depth of the recess, but this makes no material difference to the construction.

The side members are butt-jointed and housed. Notice in the diagram that the housings are all stopped short of the face edge, except those for A and B.

The skirting and picture rail are removed from the recess and the sides of the cupboard put into place. Holes for screws should be bored and Rawlplugs provided in the wall, and the sides fixed in place temporarily.

Measurements between the sides should now be taken to ensure that they are quite straight and parallel, and it may be necessary to pack one side or the other away from the wall a little to allow for hollows or bulges. The small gaps thus formed may be covered afterwards by a small moulding shaped to fit the wall.

Exact measurements may now be taken for the lengths of the top, centre and bottom shelves (A, D and B), and for the frame to form the division (C). This latter is made up in exactly the same way as the frame for the wardrobes in the last article.

The rest of the carcass members being prepared, the sides are released and the whole carcass put together and then introduced into the recess as a unit. It is obvious that all measurements must be carefully taken and all sizes accurately cut to avoid snags at this point.

The bottom shelf (B) is supported on 3-in. by 2-in. blocks fixed to the floor and adjusted if necessary for level, and it should be noted that this shelf stops $\frac{7}{8}$ in. back from the front edge to allow for the skirting (E) to be fixed in front of it. The shelf (B) extends 1 in. or so beyond the face of the drawers and the rest of the carcass. This, as well as other points, is made clear in the cross-section through the line x . . . x.

Small fillets to form door stops are fitted on the underside of (A) and the upper side of (B).

The sizes for drawers and doors may now be accurately taken. The drawer construction follows that advised in the wardrobe article, and one of the drawers might well be fitted with divisions for cutlery and lined with green baize.

The doors. Those for the upper cupboard are framed out of 2-in. by 1-in. timber, mortice and tenoned. The groove for the glass is formed of $\frac{1}{4}$ -in. or $\frac{5}{16}$ -in. bead bought ready-made, and whether the doors are made of hardwood or deal, it would be well to use hardwood beads. The beads are mitred at the corners and glued, and pinned with $\frac{3}{4}$ -in. panel pins.

The leaded-light effect is obtained by the use of strips of lead sold especially for this purpose and fixed to the glass with an adhesive supplied with the lead.

The doors are hung to the sides of the cupboard by 2-in. brass butts.

The doors for the lower cupboard are of laminated board, or frames covered with 3-ply, as described for the wardrobe doors.

Three shelves are shown in the illustration, but this number and their spacings are of course optional.

In wide recesses a supporting upright division in both upper and lower cupboards may be deemed necessary, but these may be omitted for widths of 3 ft. 6 in. or less unless extremely heavy articles are to be stored.

The small beads shown fixed at about 2 in.-3 in. from the back of the shelves in the upper cupboard will be found convenient to support plates leant against the back of the cupboard.

Built-in book shelves (Fig. 3)

This is a very simple fitment to construct, and consists essentially of uprights, made of 3-in. by 1-in. prepared timber, in pairs at each side of the recess, on which are supported shelves made of 9-in. by 1-in. prepared timber. The uprights are shown in the sketch resting on the top of a square-edged skirting. If the skirting has a moulded upper edge, the moulding should be cut away at the points where the uprights rest. Only the top and bottom shelves are permanently fixed, the rest being adjustable to fit various sizes of book. This adjustment is contrived by the provision of movable fillets on which the shelves rest. As the illustration makes clear, these fillets are provided with two $\frac{1}{2}$ -in. round pins which engage in holes bored in the uprights

at $1\frac{1}{2}$ -in. intervals. The fillets are made of hardwood and the pins of ordinary $\frac{1}{2}$ -in. dowel rod. The pins will need a light glass-papering so that their entrance into the $\frac{1}{2}$ -in. holes is easy without being slack.

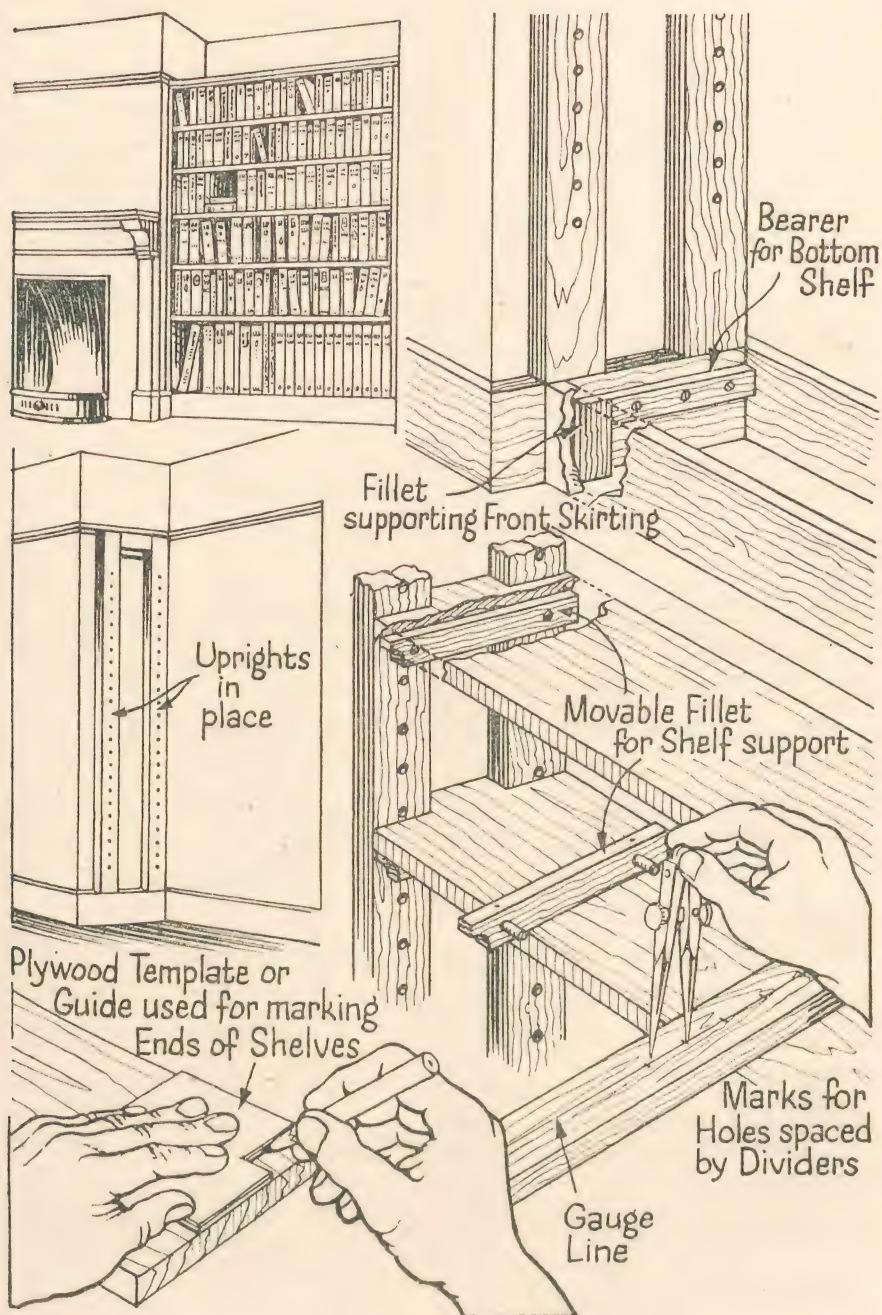


FIG. 3

The uprights are fixed temporarily to the walls of the recess and a level line taken from the top of the skirting. The holes must be spaced from this level line, and to ensure that correct spacing, a pair of dividers should be set and carefully spaced along a line gauged through the centre of each upright. This process is made clear in the illustration.

The uprights, when bored, are fixed firmly to the wall by Rawlplugs and screws, the front edge of the front upright being 9 in. from the rear wall of the recess. The 9-in. by 1-in. shelves will be $8\frac{7}{8}$ in. wide when bought prepared, and this will allow $\frac{1}{8}$ -in. gap at the back of the shelf to allow for any small irregularity of wall surface.

The ends of the shelves are shouldered to fit round the uprights as shown, and it may well be worth while making a templet or pattern of plywood which, used to mark the cut in each end, will ensure accuracy.

The bottom shelf is reduced in width to 8 in. to allow for a skirting at the base of the book-shelves as shown.

In place of the movable fillet, short pieces of $\frac{1}{2}$ -in. dowel rod may be cut. These may be pushed into the holes and should protrude for at least $1\frac{1}{4}$ in., so forming supports for the shelves. It is considered, however, that the little extra work in making the fillets is well worth while.

When fitting the dowels into the fillet, a really good fit must be achieved. One sure way to do this is to bore $\frac{7}{16}$ -in. holes in the fillet and carefully pare the $\frac{1}{2}$ -in. rod to a tight fit. The dowels are glued in place and may be further secured by a panel pin driven from the edge of the fillet. The fillets should be made of $1\frac{1}{4}$ -in. by $\frac{1}{2}$ -in. hardwood.

The top shelf is fixed to the top of the uprights and also to the spacing piece screwed on the wall between them. It may be left quite plain, or the picture rail continued from the chimney breast and nailed to it.

Shelves of 9 in. by 1 in. may be used to span a recess of 4 ft.-4 ft. 6 in. without intermediate support. For shelves of greater width, an extra pair of uprights should be provided in the centre of the fitting. The shelves in this case would be broken at the centre uprights and supported exactly as at the wall ends, on fillets or dowels.

Window seat (Fig. 4)

This is one of the best ways of utilizing the space within a bay window and is quite a simple job. The example shown is for a recess with tapering sides, but that for a rectangular bay

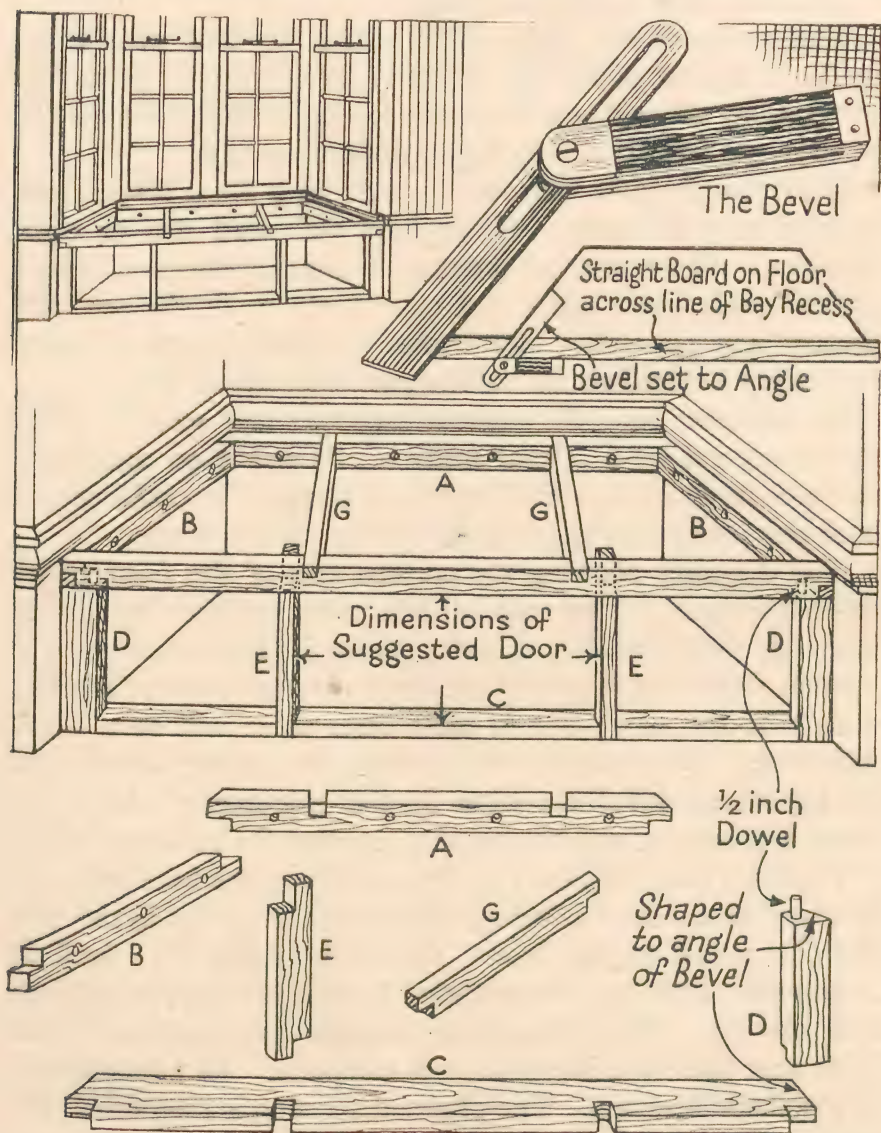


FIG. 4

would be even simpler, as all lap joints would have square shoulders.

A height of 1 ft. 8 in. from the floor to the top of the cushions is usual, and this will usually allow for a narrow space of wall

between the top of the seat and the nosing at the bottom of the window to be upholstered as a back rest.

The whole of the framing, or carcase, is of 2-in. by 1-in. timber, and providing it is reasonably straight and true as left by the saw, planing is unnecessary.

The perpendicular part of the seat is covered with 3-ply, as also is the seat under the cushions. If it is desired to use the space below the seat as a locker for storage a small door may be fitted in the front panel between the supports (E).

If the bay is quite narrow, say 3 ft. to 4 ft., a single loose cushion may be made. Wider bays will need two or three cushions. These may be ordered from an upholsterer, and a pattern made from paper and cut exactly to fit the seat will prevent any possibility of mistake. A short length of spare wall-paper is excellent for cutting patterns such as this.

On the other hand the amateur carpenter may seek his wife's assistance, and by a careful study of the article on upholstery and soft furnishings which begins on p. 224, the cushions and back upholstery may quite well be undertaken at home.

The diagrams showing the construction of the framing are self-explanatory. The angle of the shoulders for the halving joints in the case of a tapering recess is ascertained by the method illustrated. Ideally the angle for both sides of the bay should be the same, but in most cases there will be a slight difference. The bevel should therefore be set for one side of the bay recess and all the joints for that side marked out. The bevel is then reset and the process repeated for the other side.

The back bearer A, the side bearers B and the base bearer C are fixed first, A and B being screwed to Rawlplugs in the wall and C screwed to the floor. The front bearer F is fixed in conjunction with the side uprights D, which are dowelled into it at the top. The intermediate bearers and uprights G and E are next fitted and the framing is complete. All joints should be glued and screwed. The plywood sheeting is then fitted and fixed, and apart from the cushions and upholstery, the seat is complete, unless, as noted, a door is fitted to the front panel to afford access to the space behind for storage purposes. If this is desired, the rectangle of ply between the uprights E is cut out along the lines denoted by the arrows in the design. If this is carefully done, the piece cut out may be used for the front

panel of the door, which is fixed to a frame halved together and made of $1\frac{1}{2}$ -in. by $\frac{3}{4}$ -in. timber. To cut this rectangle, a hole is made by a bradawl in one corner and the point of a keyhole saw is then introduced.

Dressing-table built in to bay window (Fig. 5)

The construction of this fitting is such that, while fitted snugly into the recess of a bay window, it may be dismantled and removed by a leaseholder or tenant at the expiration of his term. The solid ends makes it capable of being reassembled with the addition of a plywood back as a separate piece of furniture in another position. It comprises six drawers and a cupboard for soiled linen. Five of the drawers and the cupboard may be opened while the user is seated at the table.

The top may be covered as shown with a sheet of glass, under which may be displayed a piece of lace or crochet work. The front edge of the glass is ground, or may alternatively be covered with a small cover moulding such as that shown on p. 155.

A separate 3-piece mirror is used on a fitting of this kind.

This fitting may also be used as a writing desk fitted to a bay in a lounge or living-room, and in this case the cupboard might well be replaced by three drawers to match the other side.

The only solid horizontal member of the carcase is the top. This is butt-jointed out of 1-in. prepared material. Alternatively a frame may be constructed similar to B and covered with plywood, and this would be quite satisfactory under the glass top.

All other horizontal members are framed of 1-in. prepared timber exactly as those described for the wardrobes earlier in this section. The guides for the drawers, and the drawers themselves, are also as those illustrated in the same place.

The height of the table is normally 2 ft. 6 in., and it is suggested that the top three drawers should be about $3\frac{1}{2}$ in. in depth so that plenty of leg room is allowed in the knee-hole.

The table illustrated is shown as extending from front to back of the bay recess, but in extra deep bays it would be set in from the face of the recess, and in extra shallow bays it might be allowed to stand forward a few inches into the room.

The four upright members are solid and butt-jointed of 1-in. timber and housed to take the horizontal members as shown.

It is suggested that the carcase is prepared and fitted together and placed in position in the bay in one piece, the drawers and door being made and fitted afterwards.

It may appear, after careful measurement of the bay recess,

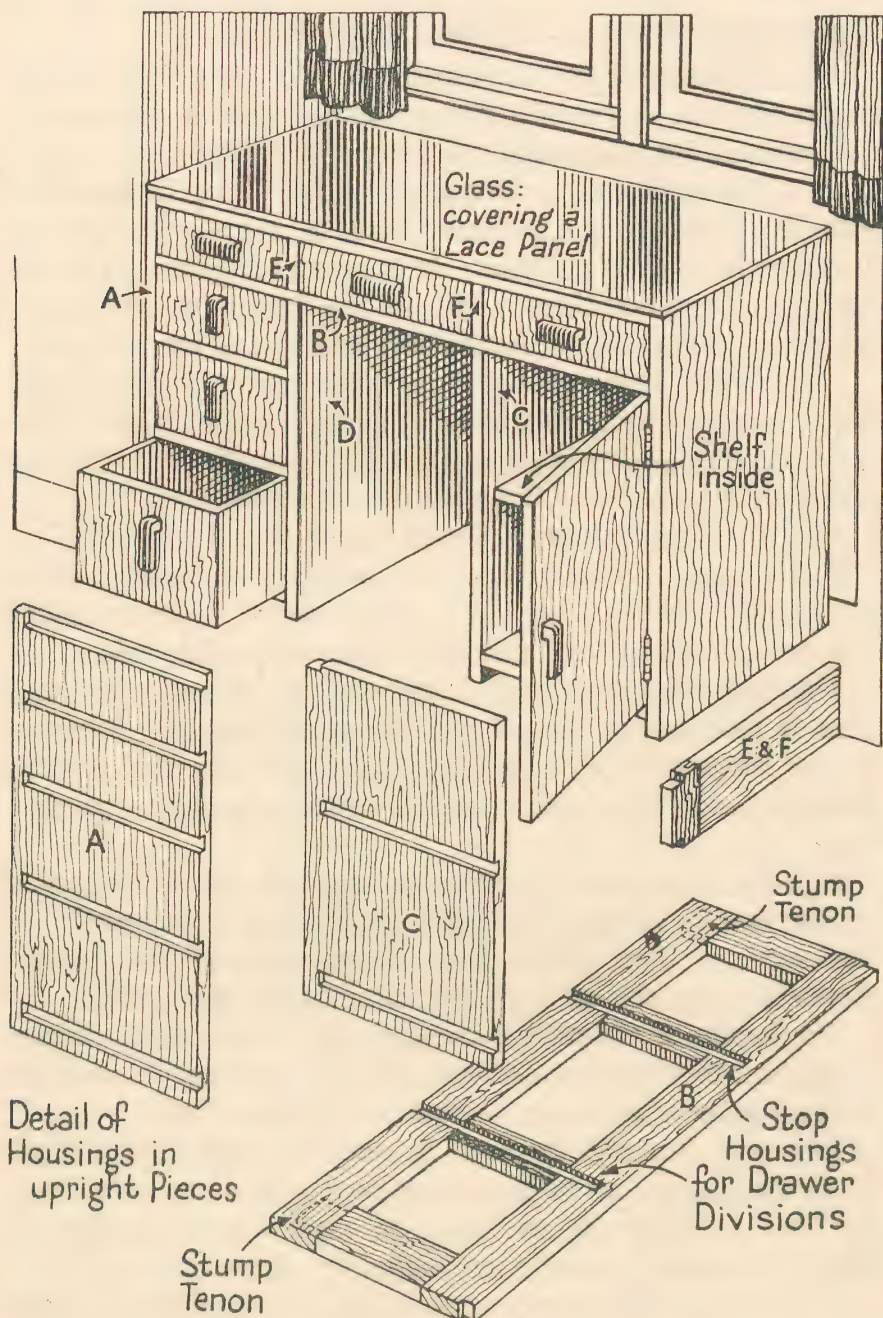


FIG. 5

that the walls are not parallel, and in this case it is suggested that the carcase be made to fit the narrowest point, and if this results in a gap at the front edges, this is covered by a suitable moulding fixed by panel pins.

The details given in these first articles in this section are sufficient not only to give the amateur some ideas about built-in

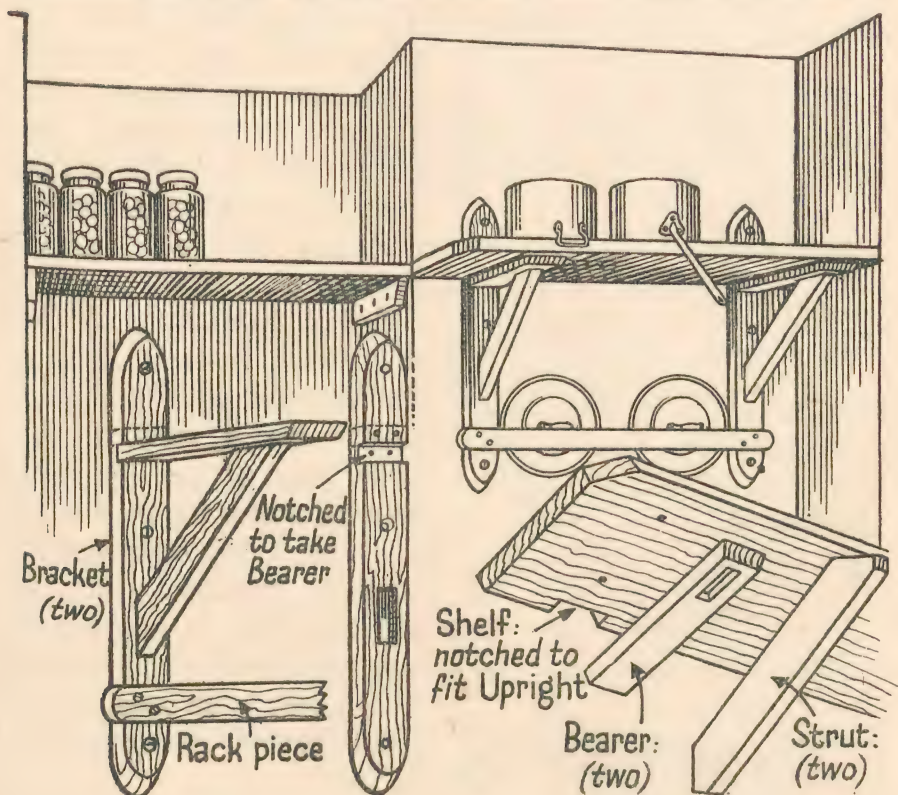


FIG. 6

furniture, but the constructional details may be used to carry out schemes adapted to individual requirements or dictated by the shape of rooms or other circumstances.

FITTINGS FOR THE KITCHEN

Fitted shelves

On the left-hand side of the illustration at Fig. 6 is shown the simplest type of all fitted shelves. It consists simply of two fillets screwed to the wall of a recess supporting a single board shelf. Fillets for this type of shelf should never be formed of material

lighter than $1\frac{1}{2}$ in. by 1 in., and 2 in. by $1\frac{1}{4}$ in. is the ideal. So often a shelf resting on flimsy, insecurely fixed fillets is overloaded with disastrous results. Wider shelves are formed of two or three boards, and in cases where large articles are to be

Battened Shelving with intermediate support



FIG. 7

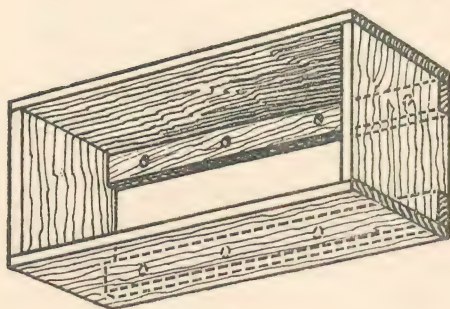


FIG. 8

accommodated, may be formed of a series of battens. These may be of $1\frac{1}{2}$ -in. by 1-in. timber with a space of $\frac{1}{2}$ in. or so between the battens. Cross battens are fixed to the underside of this type of shelves at about 2-ft. intervals, in the manner shown.

An example of shelf-fitting to gallows brackets is also shown in the saucepan rack, a narrow batten fixed to the lower part of the brackets forming a rack for the saucepan lids. The construction of these brackets, which is clearly shown, is very sound and workmanlike and should be followed in all cases where fixed gallows brackets are needed.

Shelves abutting at right angles are best supported in the manner shown in Fig. 7. The end of one shelf is bevelled to an angle not less than 45 degrees for a length equivalent to the width of the

abutting shelf, and the junction is further supported by a reinforcing batten fixed as shown.

Fig. 8 shows an independent box shelf. This is framed up as an open box, the corners either dovetailed or half-lapped. Let into the back at bottom and top are two fillets of about $2\frac{1}{2}$ in. by $\frac{3}{4}$ in., and secure fixing for the box shelf is obtained by

screwing through the fillets into Rawlplugs into the wall. Such a shelf makes a very useful fitting for books, etc., fixed at the head of a bed, or may be adapted for many other purposes. It

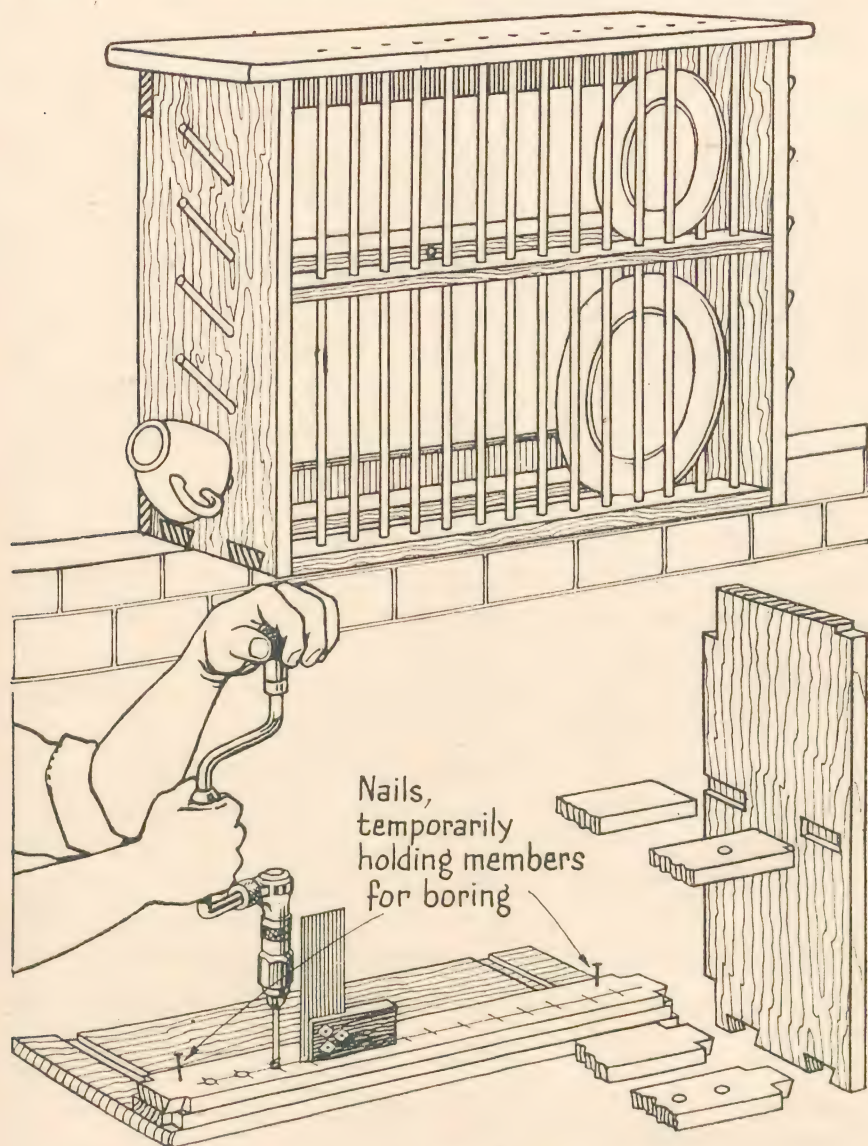


FIG. 9

may be framed up with two or more shelves, or with inset cupboards, but is shown here in its simplest form.

A variation of the independent box shelf, adapted as a draining rack, is shown at Fig. 9. The ends and top are of 9-in. by 1-in. prepared timber, and the bottom and the middle shelf are

each composed of two pieces of 3-in. by 1-in. prepared timber, the bottom being dovetailed and the middle housed to the ends as shown. The rack is fixed to the wall by screws through the fillets which are let into the ends at top and bottom.

A rack 2 ft. 3 in. long, and with the lower shelf 11 in. high and the upper 9 in. high, will be found large enough for the average household. Allowing $1\frac{1}{2}$ in. between each of the $\frac{3}{8}$ -in. dowel rods which are used for divisions, there will be room for fourteen articles on each shelf. Short lengths of dowel rod set in the ends of the rack at an angle as shown provide for ten cups. The ends of the rack are stop-housed into the top, and this latter is allowed to extend about $\frac{3}{4}$ in. beyond the ends.

The use of batten instead of solid shelves allows the drips from the crockery to drip right through the rack, which should be fixed directly above the sink, and if possible should be fixed at the top of the tiles as shown.

In making the rack, the carcase joints are first prepared and fitted. The top of the rack and the front battens of the shelves should then be fixed together by G-cramps or nails. The spacings of the divisions are then set out and the $\frac{3}{8}$ -in. holes bored through all three simultaneously. This avoids all possibility of mistakes in this operation.

The holes for the dowels are bored right through all three members, and on assembly the dowels are glued in place.

The pegs for the cups should be about $2\frac{1}{4}$ in. in length and rounded slightly at the points. Great care should be taken in the boring of the holes for these so that they are all at the same angle, for appearance sake. A piece of plywood or thick cardboard cut to the angle (about 30 degrees) would help in this operation.

Tradesmen's delivery hatch (Fig. 10)

This is a very useful fitment in households where the housewife is frequently away from home at the time the tradesmen make their deliveries. So often food is left on the step of the kitchen door or at the door of a flat in such circumstances and is exposed to dust or even to fouling by dogs.

The hatch consists of a framed box fitted with shelves and

with flap doors on both sides. It is divided into two compartments; the lower one is high enough to accommodate a quart

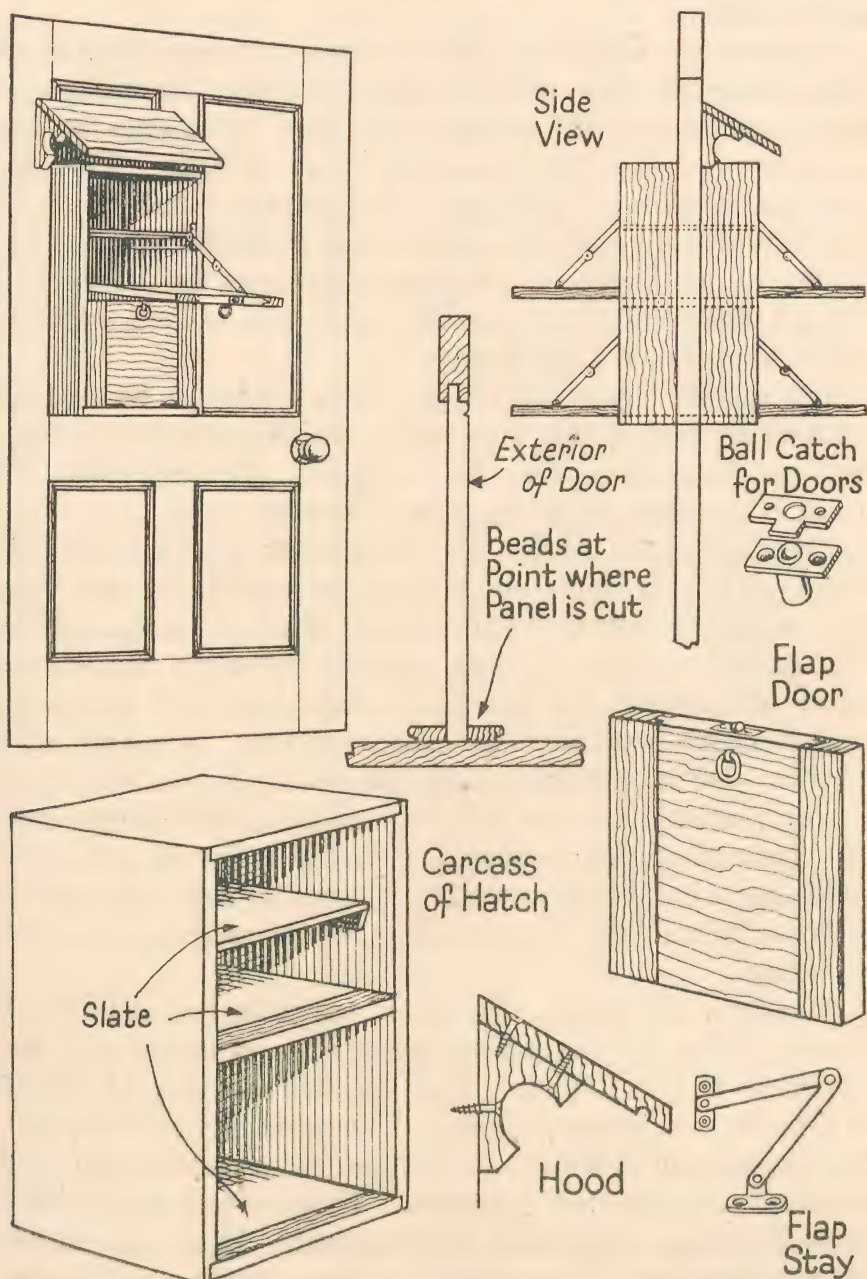


FIG. 10

milk bottle and the upper one is fitted with a shelf for smaller articles.

The outside dimensions of the carcass are 2 ft. 1 in. high,

9 in. deep and the width will be that of the door panel; 9 in. by 1 in. is a suitable size for the top and bottom, the centre division and the sides.

It is suggested that the shelf in the upper compartment be of slate resting on fillets, and that slate also covers the surfaces of the centre division and bottom of the box. The slate for this purpose may be cut from two 20-in. by 10-in. slates. This size slate has the name "Countess." It should be carefully cut to size with a cold chisel and may be fixed to the fillets and to the surface of the division and bottom of the hatch by the use of a tile adhesive. The slate provides a flat, cold surface, which is easily cleaned with a damp cloth.

Incidentally, larder shelves may, with advantage, be covered with slates fixed in this way, and as an aid to choice of slates, here are the normal sizes: 16 in. by 8 in. (Ladies); 20 in. by 10 in. (Countess); 24 in. by 12 in. (Duchess).

To return to the hatch. The panel of the door to which it is fitted will usually be two-thirds of the thickness of the door with the exterior face flush. This is made clear in the illustration. The hatch should be made up complete before the door is prepared to receive it, but the width of the panel it is to replace must be carefully measured to ensure a good fit. It will normally be about 9 in. in width in the case of the usual 2 ft. 6 in. wide door.

The carcase of the hatch is half-lapped at the corners, and the centre division stop-housed. The fillets for the slate shelf in the upper compartment are best screwed on before the carcase is finally assembled, as it is much easier to insert the screws at this stage.

The doors are of 1-in. timber and are cleated at each side as shown. They will be a little over 11 in. in height and will require to be butt-jointed. It is suggested that they be formed of 6-in. by 1-in. prepared timber. They are hinged with 1½-in. brass hinges to the bottom and centre division respectively, and are fitted with flap stays as shown. They are each fitted with a small knob and a ball catch as illustrated. These ball catches are very effective. A steel ball is in contact with a spring concealed in the barrel of the catch and the ball engages in a hole in the carcase. The door is bored to take the barrel of the catch and the face plate let in flush. A face plate is also provided for the hole in the carcase.

The hatch being completed, the door panel is cut to receive it, and it is then fixed in place by screws through the sides of the hatch and into the frame of the door. The cut end of the panel is secured to the top of the hatch by means of two beads as shown. In the case of glass panels, the beads securing the glass are taken out and the glass removed. The hatch is fixed in position and the beads cut to fit the space remaining between the hatch and the top of the panel. The glass is then cut to size and fitted in place.

It is advisable to fit a light weather-hood over the hatch to protect it in some degree from driving rain. This is made of a length of 7-in. by 1-in. timber and is supported on two shaped brackets as illustrated. A $\frac{1}{4}$ -in. drip groove is made about $\frac{3}{4}$ in. from the front edge so that moisture will drip clear of the hatch, and the hood should be covered with roofing felt.

An alternative arrangement for fitting a hatch to a door which has a full width glass panel in the upper half is illustrated at Fig. 11. The

construction is the same as for the vertical hatch, and in this case also a weather-hood should be fitted.

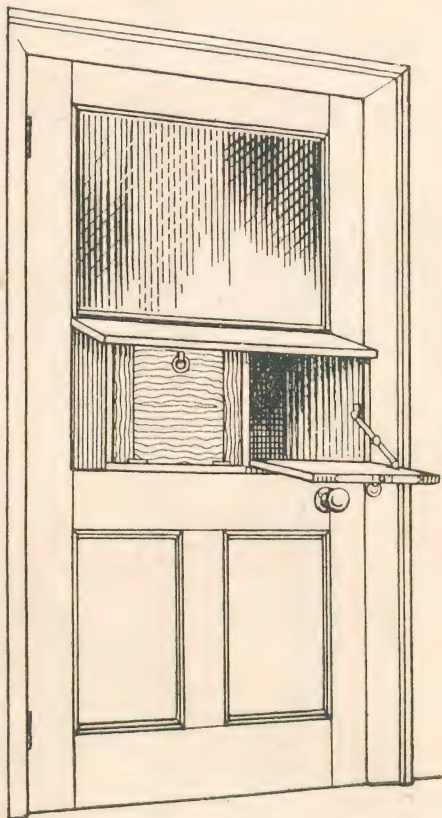


FIG. 11

Collapsible table (Fig. 12)

No fitting is so useful in the small kitchen or kitchenette as a collapsible flap table. The illustration shows a simple but sturdy type which is also an interesting exercise in home carpentry. The sizes may be varied to suit individual needs.

The whole of the construction is carried out in 1-in. prepared timber, three boards 6 in. wide being jointed together to form

the top, which is furnished with 2-in. wide cleats at either end. It is hinged to a $2\frac{1}{2}$ -in. wide support which is fixed to the wall, and also to a fillet fixed underneath it. Two swivelling brackets support the top when open, and when closed fold back under the table which drops down in front of them.

The brackets terminate at either end in $\frac{1}{4}$ -in. diameter pins

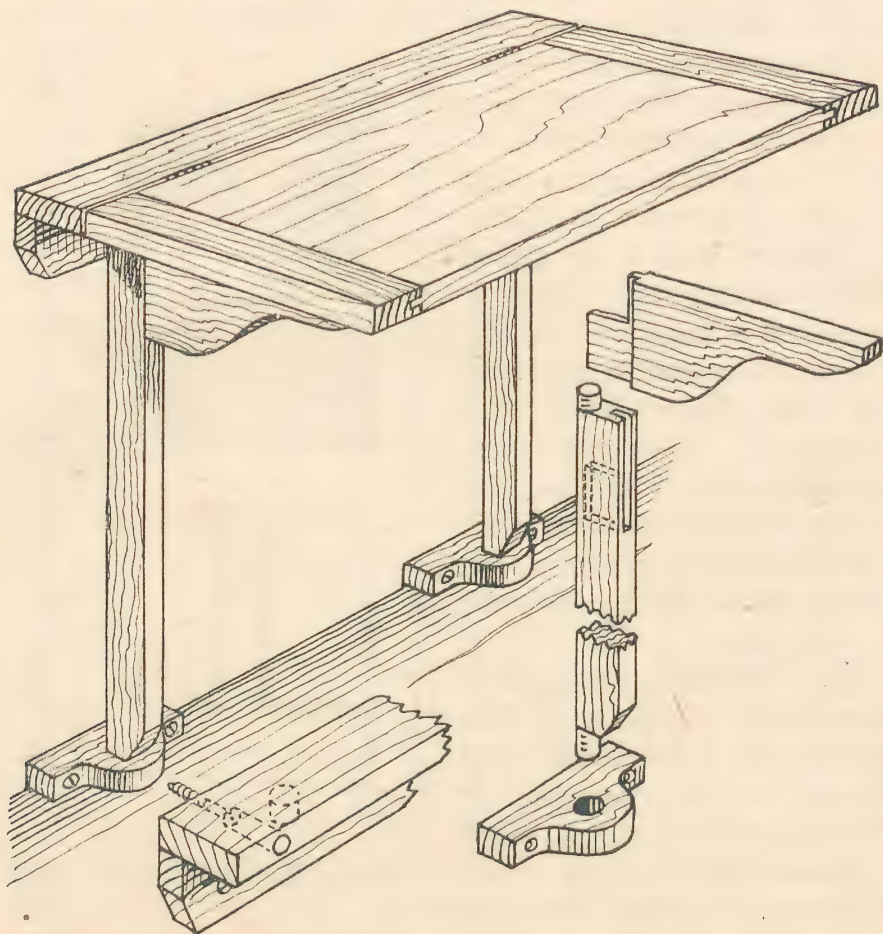


FIG. 12

formed in the thickness of the wood, and these fit into holes bored into the underside of the support to which the top is hinged, and in the shaped supports at the bottom. The back edges of the brackets are rounded to the same radius as the pins, as shown, and the construction of the mortice and tenon joint at the head of the bracket is also made quite clear in the illustration. A convenient height for the table would be 2 ft. 6 in.

The shaped supports into which are fitted the bottom pins of the brackets are shown screwed to the wall, but they may more easily be fixed to a wood skirting if such is available. The hinging piece needs really solid fixing, and therefore is fixed down to the supporting fillet and also screwed through its own thickness into Rawlplugs in the wall. For this latter purpose, 3-in. No. 12 gauge screws are used and the heads of the screws countersunk by means of a $\frac{1}{2}$ -in. hole $1\frac{1}{4}$ in. deep as shown.

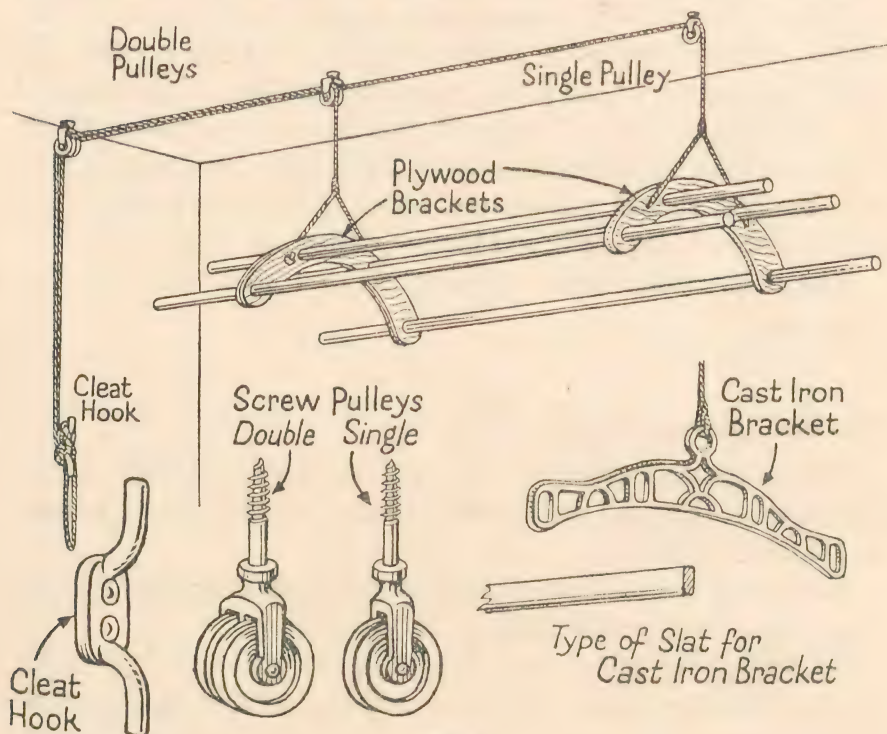


FIG. 13

These holes are afterwards filled up with a piece of $\frac{1}{2}$ -in. dowel rod.

It will be appreciated that the provision of two brackets will impart a solidity to the table which is essential in a fitment of this kind, especially if it is to be used for such tasks as ironing.

Light clothes airer (Fig. 13)

Little is needed in explanation of the construction of this fitment. The supports for the rods are of hardwood or of plywood, and the rods, which should be a tight fit, should be of $\frac{1}{2}$ -in. dowel rod. The airer is raised and lowered by means of

light sash cord passed through one single and two double pulleys as shown, and the cords are fastened to the supports by passing them through holes bored in the positions indicated, when they are knotted.

The ailer shown is intended only for light work, and the rods should not exceed 4 ft. 6 in. in length. Larger ailers are made up by preparing slats to fit the iron supports illustrated, which may be bought specially for the purpose.

Pulleys for use with ceiling ailers should be of the type illustrated, and the long screw must be firmly fixed into a joist. To find the position of the joist, measurements should be taken of the position of the nail holes in the floor of the room above. This will give an indication of the line of the joists, and a long thin bradawl should also be used to locate them accurately from below before holes are bored for the pulley screws.

The ends of the cords are attached to a hook cleat like that illustrated.

Kitchen storage fitment (Fig. 14)

This is a combination of meat safe and vegetable rack, which also contains a useful drawer which may be fitted for egg storage and kitchen cutlery.

The lower part of the fitment is made as one unit and the meat safe is afterwards fixed to the top of it.

All timber for the carcass is of 1-in. prepared deal, and the solid members—that is, the sides and top of the lower section and the top of the meat safe—are of two 6-in. by 1-in. boards butt-jointed together.

The vegetable trays are constructed of 1-in. square fillets, to which is nailed metal mesh. This may be perforated zinc or wire mesh, but the former is preferred.

The frames which form the bottoms of the vegetable racks are halved together and covered with the mesh. Perforated zinc is fixed with $\frac{1}{2}$ -in. round wire nails and mesh with $\frac{1}{2}$ -in. staples. The frames are secured by screws into the carcass sides.

The fronts of the racks are formed by nailing mesh to the front of the tray and to an upper fillet which is housed into the carcass sides. This arrangement is made clear in the section in

the illustration. Note that the mesh is bent round the fillets and that the upper edge is covered by a 1-in. by $\frac{1}{4}$ -in. bead as a safety precaution.

It will be found an advantage to use a flat heavy weight, such as a flat iron, to give solidity while fixing the mesh.

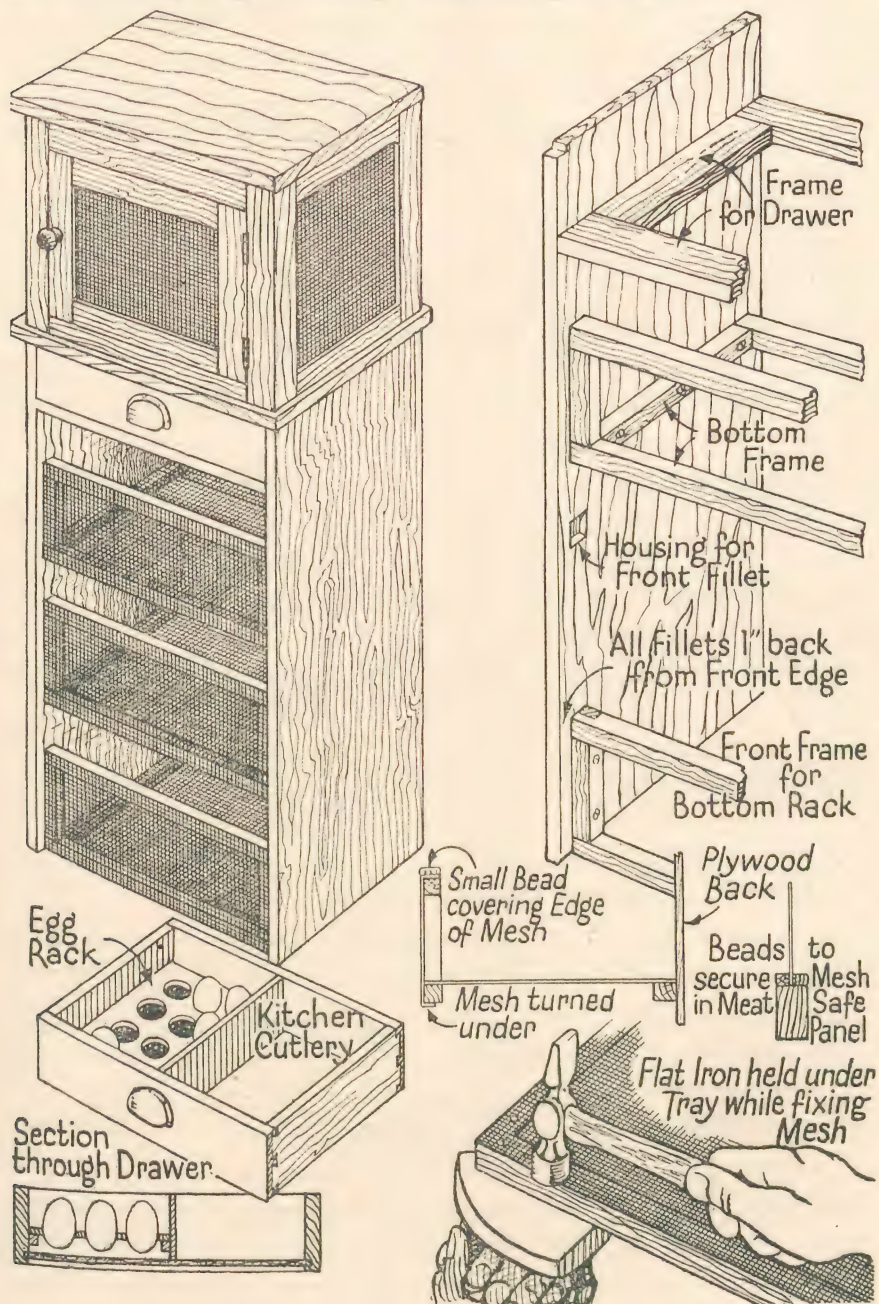


FIG. 14

The bottom vegetable rack, in which it is suggested potatoes might be stored, has no mesh at the bottom, the fitment merely resting on the floor. The front of this bottom rack should be made as a unit and fixed by screws so that it may be removed occasionally to permit of cleaning out.

The drawer slides on a frame of $1\frac{1}{2}$ -in. by 1-in. prepared timber, which is housed into the sides. The construction of the drawer is shown in the illustration, and follows that recommended for those for the other fitments dealt with earlier in this section.

The top of the lower section is rounded at the front and ends, and to this is fixed the meat safe.

The meat safe. The carcase of this part of the fitment consists of one front and two side frames made out of $1\frac{1}{2}$ -in. by 1-in. prepared timber, and a solid top with rounded front edge and ends. The frames may be half-lapped or mortice and tenoned together, as may the frame for the door.

The mesh is held in the panels by small hardwood beads held by $\frac{3}{4}$ -in. panel pins. The door is fitted with a ball catch and knob. One shelf is fitted, and rests on fillets screwed to the side frames, and this shelf may be of slate as suggested for the tradesmen's delivery hatch.

The whole meat safe is fixed to the lower section by screws through the top of the latter.

The final operation is the fitting of the plywood back, which, after being cut to size, is nailed on, using $\frac{3}{4}$ -in. panel pins.

Draining boards and cupboards (Fig. 15)

In so many kitchens and kitchenettes the space below sink and draining boards is just a disorganized dump for house cloths, pails and scrubbing brushes, and is scarcely ever dry and tidy.

Illustrated is a suggestion for twin draining boards, shelves and cupboards, which would make for efficiency and tidiness and which is quite pleasing in appearance.

In kitchens where the sink abuts on the wall, one side only of the assembly can be provided, but the construction remains the same. The height and depth of the fitment are governed by the size and position of the sink, so it is impossible to give complete measurements.

The draining boards. It is suggested that the draining board be 2 ft. to 2 ft. 6 in. in length, according to the space available, and that they be 2 in. wider than the depth of the sink so as to

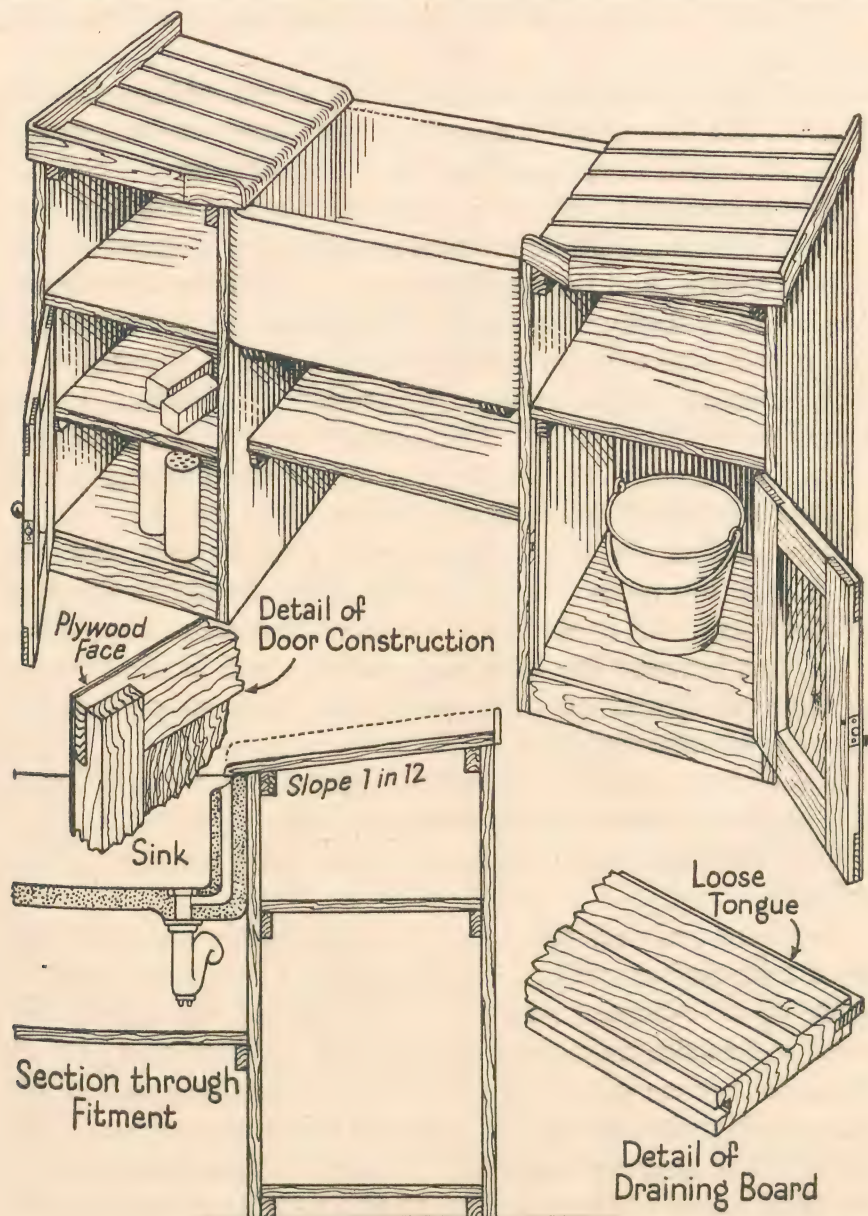


FIG. 15

allow them to stand forward of the front edge of the sink as shown. They should, if possible, be made of teak. This timber is a favourite for the purpose as it is practically rot-proof and water resistant.

As mentioned in the article on materials earlier in this section, many manufacturers of ready-prepared wood products list tongued and grooved teak, complete with draining grooves, which may be easily made up into draining boards of any width and length.

Ordinary glue should not be used in assembling draining boards, but they should be put together either with waterproof glue, often sold in powder form, or with lead paint.

If it is decided to make the draining boards of deal, the component boards should be grooved at each edge to accommodate a loose tongue, and the draining grooves should be made before the board is finally assembled. The draining grooves may be made with a plough, and the plough iron should, if possible, be well rounded on the oilstone to produce the shallow groove shown in the illustration. This shows a typical board prepared ready for assembly. It should be noted that the drainage groove in the front board is slanted away towards the sink.

The sides of the board are made of 2-in. by $\frac{3}{8}$ -in. teak and have their top edges rounded. They are screwed to the edge of the board, and when fixing, a coat of lead paint is provided. The joint between the back edge and the wall is filled with a mixture of linseed oil putty and white lead, to prevent the entrance of water splashes.

Brass screws should be used throughout the construction of this fitment as iron screws would soon rust.

The draining boards are fixed so that there is a 2-in. fall to the sink.

Cupboard and shelf fitment. The four upright members may be of 1-in. timber and butt-jointed, or if preferred, they may be made up of V-jointed matching. The section through the fitment makes the method of fixing plain. Fillets of $1\frac{1}{4}$ -in. by $1\frac{1}{4}$ -in. timber are fixed to the floor and to the under-side of the draining board, and the uprights are screwed to these. The fillets on the draining board fulfil the double function of holding together the members of the board and providing fixing for the uprights.

The solid shelf that also forms the top of the cupboard may be housed into the uprights, but if matching is used for these, the shelf may be fixed with screws.

The shelf under the sink is supported on fillets as shown, and

it is essential that it be fixed at a height which will allow a bowl to be placed under the trap from the sink to catch the water released when the water seal is emptied for clearing purposes. This shelf is set back 4 in. from the face of the fitment for the convenience of those using the sink.

In the twin assembly the right-hand cupboard is designed to accommodate buckets, etc., and has no shelves. The left-hand cupboard has two shelves and is intended for storing soap, cleaning powders, etc.

The open compartment under the draining boards will be found useful for dish cloths, house cloths, scrubbing brushes, etc., and the bottoms of these compartments might well be covered with 6-in. white tiles fitted by a tile adhesive to facilitate cleaning.

The 2-in. bottom members of the cupboards are fixed to the end of the floor fillets.

The cupboard doors will be made of V-jointed matching, if this has been used for the uprights, or of a plywood covered frame if the uprights are solid.

FOUR USEFUL THINGS TO MAKE

Household steps (Figs. 16 and 17)

The steps illustrated are a useful size for household use, but shorter or taller pairs may be constructed for special purposes by adaptations of the measurements. The details of construction will be the same.

The example shown has sides of 4 ft. approximately and has five treads spaced 7 in. apart. All timber used is 1-in. prepared.

The first operation is the preparation of the sides, or strings as they are called technically. These are 4 in. in width and should be cut to a length of 4 ft. 3 in. in the first instance.

A practical method of finding the angle of the treads to the edge of the string is shown. A square line is marked across the width of the string and a pencil mark made $1\frac{1}{2}$ in. to one side of it on the back edge. A bevel set to this angle will give the correct slope for the treads.

Another angle has to be considered when setting out the housings. The steps taper from bottom to top, from 1 ft. 6 in.

to 1 ft., and therefore the housings are not sunk square to the face of the string but at a slight angle. This angle may be

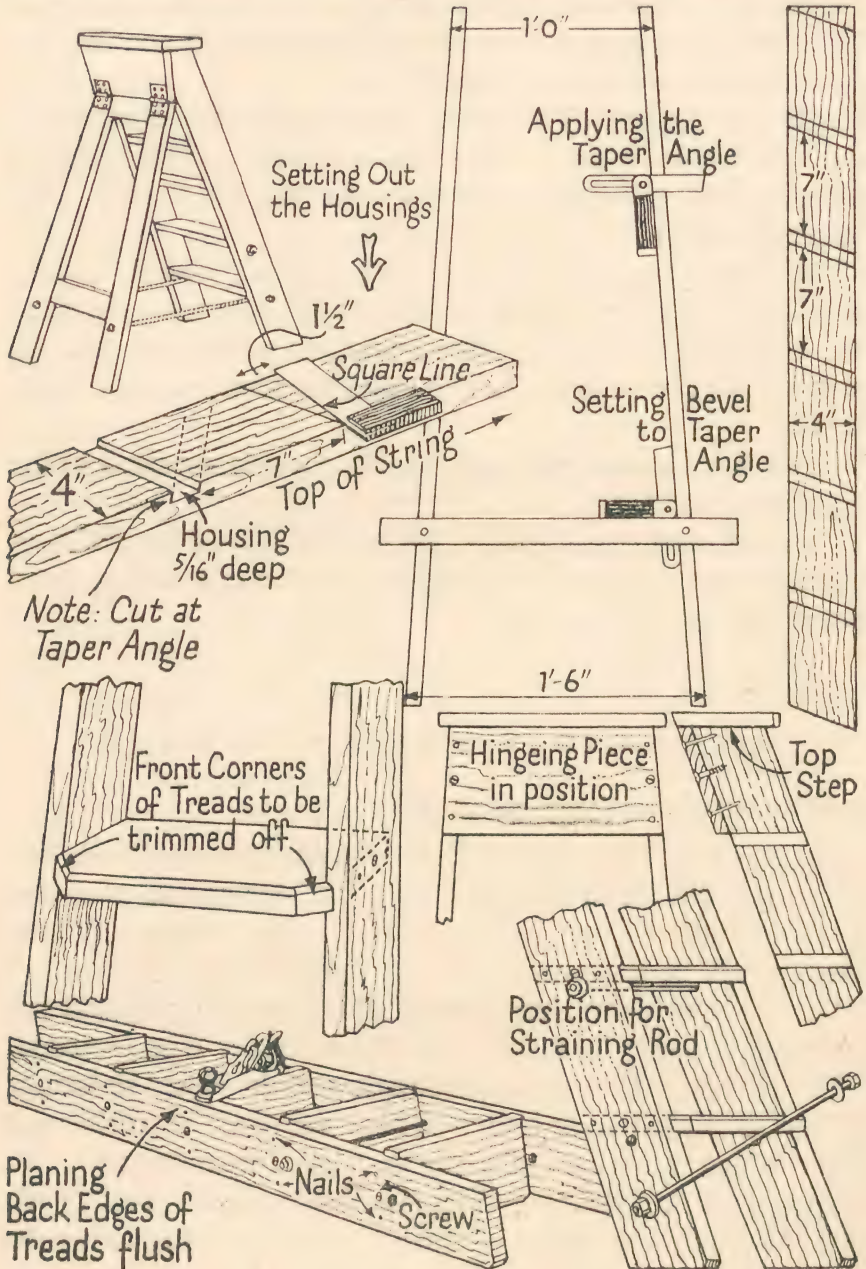


FIG. 16

allowed for by slightly undercutting each saw cut when forming the housings, but it is better to ascertain the correct angle and set the bevel to it. To do this, the strings are laid on the bench

at the correct taper and a short length of wood laid across them at an equal distance, say 1 ft. from the ends. The angle between this length of wood and the string is that required. The process is made perfectly clear in Fig. 16.

The housings being completed the ends of the strings are trimmed to the same bevel as the housings.

The treads. The strings are again laid on the bench at the correct taper, and the lengths of the five treads taken. These are cut from 5-in. by 1-in. prepared wood, the ends being square

across but sloped in the thickness to the taper bevel.

The front frame of the steps may then be put together, using one 2-in. No. 10 screw in the centre of each tread, and a 2-in. oval wire nail on either side of it. Diagonal measurements should be taken after assembly and before fixing to ensure squareness.

The back edges of the treads being still square are planed off and the front corners cut off and chamfered as shown.

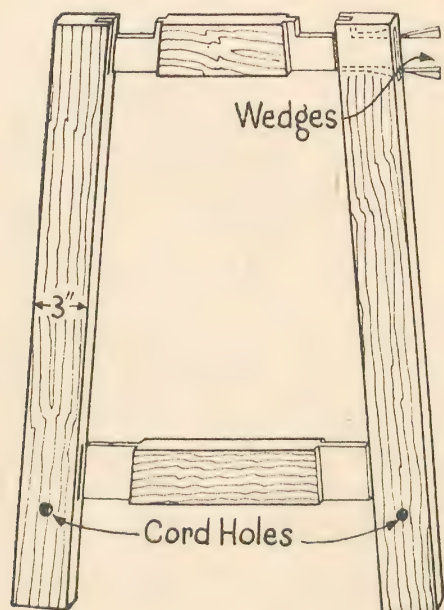


FIG. 17

The top and the hinging piece at the back are fitted and screwed in position and are made out of two boards of 6-in. by 1-in. prepared.

The back frame consists of two stiles and a top and bottom rail, which is fitted 9 in. from the bottom of the frame; all members are of 3-in. by 1-in. prepared timber and mortice and tenoned together as shown in Fig. 17. The back frame is hinged to the hinging piece by two 2-in. back flaps and $\frac{3}{8}$ -in. holes bored through the strings of the front frame and through the stiles of the back frame. These holes are positioned 8 in. up from floor level.

The steps are erected and the legs spread so that the treads are level, and good quality sash cord threaded through the holes and knotted in position.

Household steps are frequently subject to rough usage, and it is well worth while to fit one straining bolt. This is a length of $\frac{1}{4}$ -in. iron rod with a thread at either end furnished with a nut and washer. The best position for it is immediately under the second tread from the bottom of the steps; $\frac{1}{4}$ -in. holes are bored in the centre of each string and the straining rod fitted and the nuts screwed up tightly. The ends of the rod are then cut

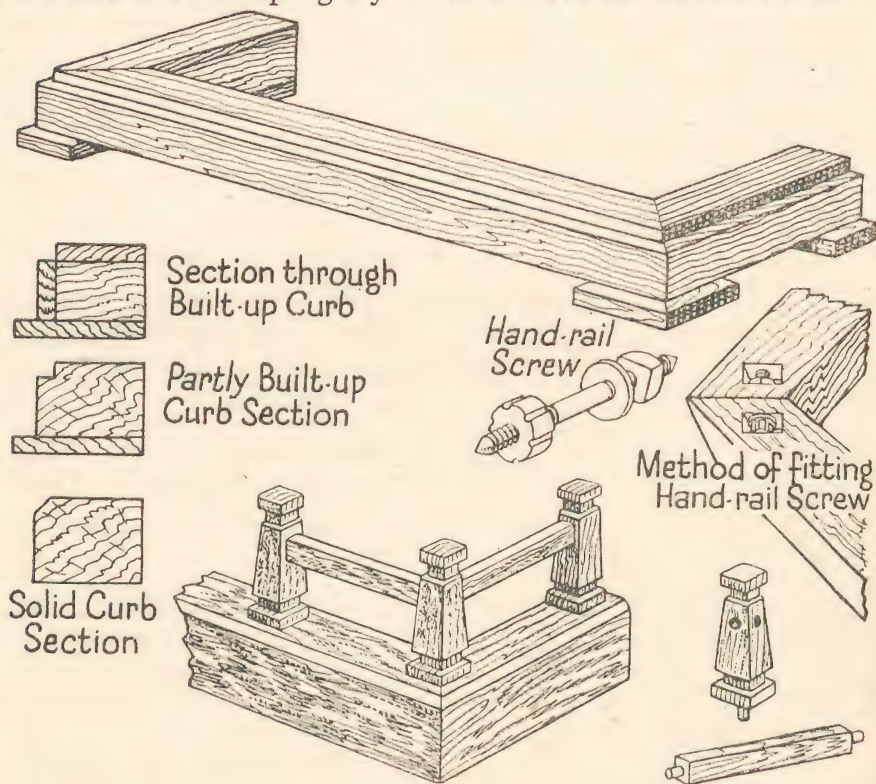


FIG. 18

off about $\frac{1}{8}$ in. beyond the nut and burred over with a hammer to prevent loosening.

Wooden curb (Fig. 18)

Making a wooden curb is a very simple yet satisfactory job involving the use of one joint only, the mitre. The illustration shows a curb of pleasing modern design, which is built up by $\frac{1}{2}$ in. thicknesses of hardwood on a softwood core. A section is shown in the illustration.

The core is of 3-in. by 2-in. prepared deal. The mitres are cut and trimmed with the plane. They must be accurately

square in depth or the curb will be twisted and will never lie flat. The core is then put together. The mitres may be nailed or screwed together and glued, but the hand-rail screw illustrated makes a much better job. Two $3\frac{1}{2}$ -in. by $\frac{5}{16}$ -in. bolts are required, a view of the mitre with the bolt fitted is shown. A $\frac{5}{16}$ -in. hole is bored half-way through the thickness of the material and the nuts are accommodated in mortices cut as shown. The thicker nut with the slots cut in it is the one used for tightening up the bolt, and the mortice for the square nut should be so narrow that it prevents it turning while the slotted nut is being tightened. The tightening is done by putting the point of a screwdriver in the slots in the nut and tapping it round with a mallet. A special hand-rail punch is sold for the job, but it is hardly worth the outlay for the amateur. Just before the mitre is quite closed a little glue is worked in and the nut finally tightened.

The wood for the covering pieces is $\frac{1}{2}$ -in. prepared in thickness, and the timber may be chosen to match that of the woodwork of the fireplace surround or of the furniture. It is fixed to the wooden core, using glue and one or two 1-in. panel pins as necessary. The heads of the panel pins are afterwards punched below the surface and the holes filled with plastic wood. The joints at the corners are all mitres.

A narrow strip of thin sheet brass or copper is fixed as a fire-proof lining to the inside of the finished curb and extends to within a quarter of an inch of the top inside edge, thus hiding the joint of the top covering piece.

The metal lining is fixed on by means of $\frac{1}{2}$ -in. brass pins with round heads, known as escutcheon pins.

Two other alternative sections are shown, one partly built up and one solid. A suggestion is also made for a curb made up of the solid section and with the corners fitted with posts and rails. Oak would be a suitable timber for this curb and the posts and rails may be bought ready prepared at shops which deal in this class of goods. They are fitted together by means of dowels turned on the ends during manufacture, as illustrated.

Floor standard electric lamp (Fig. 19)

This lamp standard is *en suite* with the modern curb, which

was the last item discussed. It is 5 ft. high and the main base block is 12 in. square. The four square feet project $\frac{1}{2}$ in. on each side.

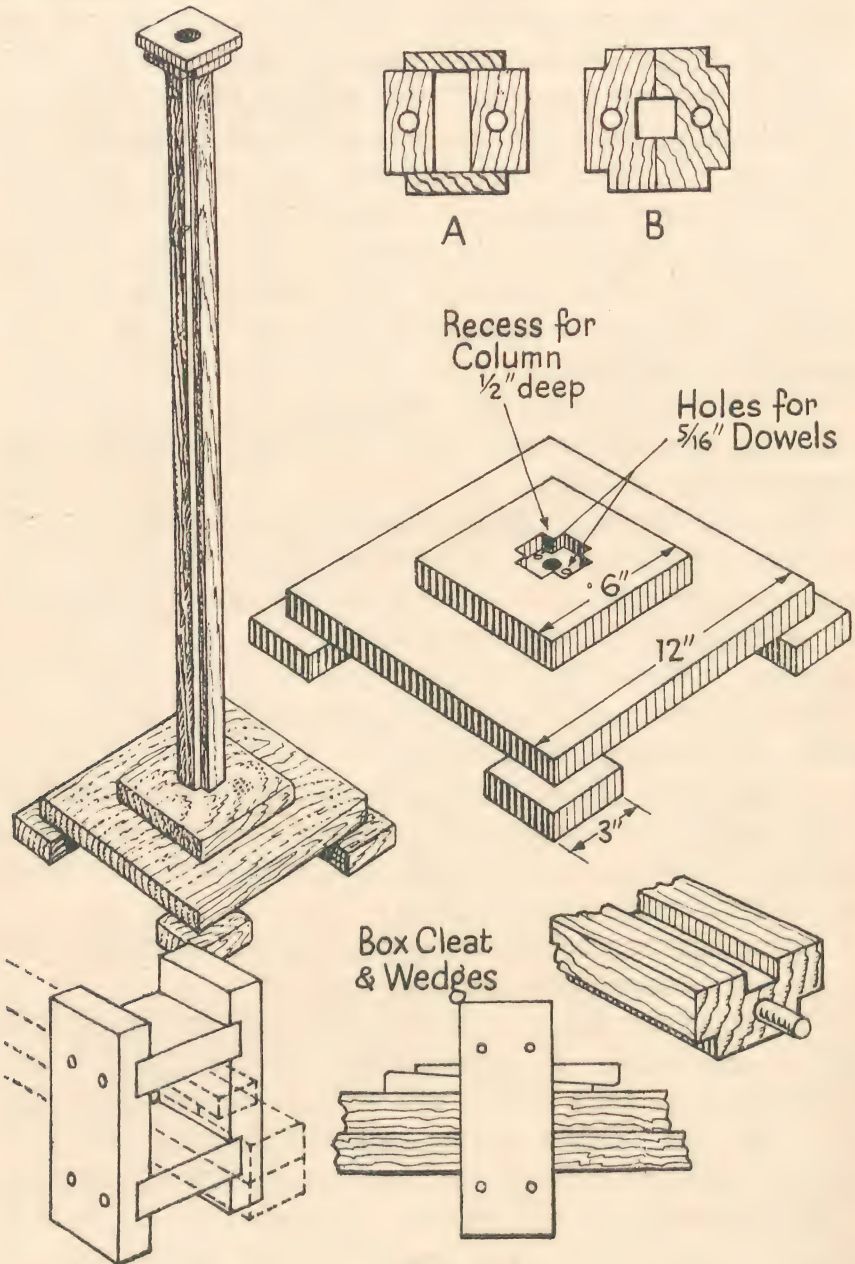


FIG. 19

Two methods of constructing the column are shown. "A" is made of four lengths of timber, two of which are $1\frac{1}{2}$ in. by $\frac{3}{4}$ in. and two of $1\frac{1}{2}$ in. by $\frac{1}{4}$ in., and these are glued and pinned with

panel pins to form a hollow column through which the wire for the electric lamp is threaded. "B" consists of two lengths of 2 in. by 1 in. Down the length of each piece is ploughed a $\frac{1}{2}$ -in. groove $\frac{1}{4}$ in. deep, which results in a $\frac{1}{2}$ -in. square hole for the wire. The two pieces are glued together and should be held securely until the glue has set by means of G-cramps or box cleats and wedges. An easily constructed box cleat which may be knocked up in a few minutes is illustrated. It is a simple open frame of odd scraps of wood housed together and nailed. The ready glued joint is slid through the cleat and a pair of wedges driven tightly between it and the top member of the cleat. Four such cleats would be quite sufficient for the 4-ft. 9-in. joint we are considering.

The cap at the top of the column is made of one $2\frac{1}{2}$ -in. by $2\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. piece, glued to one of 3 in. by 3 in. by $\frac{1}{2}$ in. A $\frac{1}{2}$ -in. hole is bored through the cap for the wire.

The base is made up of a 6-in. by 6-in. by 1-in. square on a 12-in. by 12-in. by 1-in. square. The latter would need to be butt-jointed out of two 6-in. by 1-in. pieces. The smaller square is fixed to the larger by glue and screwed from underneath. Again a $\frac{1}{2}$ -in. hole is bored through the centre of both squares. Four 3-in. by 3-in. by 1-in. feet are glued and screwed to the corners of the base.

The bottom of column is recessed $\frac{1}{2}$ in. into the 6-in. by 6-in. square, and two $\frac{5}{16}$ -in. dowels further strengthen the joint, which should be well glued and allowed to set quite hard. Great care must be taken to make sure that the lamp standard will stand quite upright. The best test for this is to check with a square the angle between the base and the column.

Pendant electric fitting (Fig. 20)

Very simple to make, this fitting accords with modern furnishing ideas and is in keeping with the curb and standard lamp already dealt with. The illustration makes the construction quite clear. The sizes may be adapted to suit individual requirements, but as a guide the one illustrated is 1 ft. 8 in. wide between the extreme ends of the arms and is 1 ft. 8 in. high.

The stem of the fitting is made up of two pieces of $1\frac{1}{2}$ -in. by $\frac{3}{4}$ -in. wood, in each of which is a plough groove $\frac{3}{8}$ in. wide and

$\frac{3}{16}$ in. deep, which provides a $\frac{3}{8}$ -in. square hole through the stem to accommodate the wire.

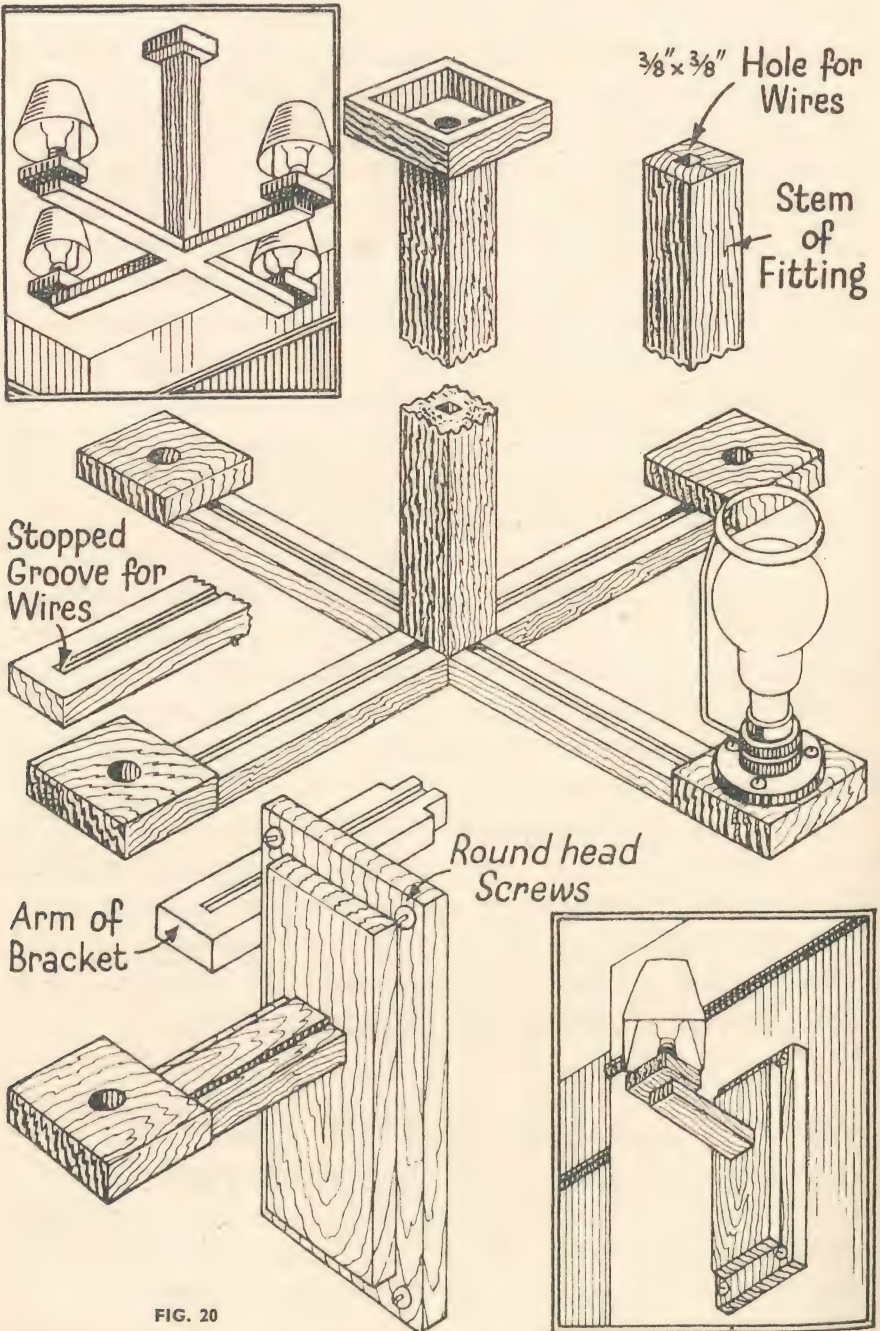


FIG. 20

To the top of the stem is fixed a 3-in. by 3-in. hollow block. These are sold in electrical stores as base blocks for switches. It allows room in the hollow interior for the wire.

The arms are made of two 20-in. by $1\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. pieces, halved together in the middle and fixed to the bottom of the stem by $1\frac{1}{2}$ -in. oval wire nails, which are punched below the surface and the holes stopped with plastic wood. $2\frac{1}{2}$ -in. by $2\frac{1}{2}$ -in. ornamental pads glued to the end of the arms have holes bored in them to fit the lamp fittings, and a groove $\frac{1}{4}$ in. wide and $\frac{1}{4}$ in. deep in each arm houses the wire to the lamps. These grooves are stopped $\frac{3}{4}$ in. from the ends of the arms so that they do not show.

The fitting is fixed to the ceiling by means of two round-headed screws through the switch block at the top.

Small shades of parchment or imitation parchment may be obtained for fittings of this kind. They have spring clips which fit over the lamps.

Wall bracket to match. The arm of the bracket extends about 6 in. from the wall, and the wall pad is 6 in. long. The arm is of $1\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. wood and has a $2\frac{1}{2}$ -in. by $2\frac{1}{2}$ -in. pad at the end similar to that on the arms of the suspended fitting. The arm of the bracket is tenoned and glued to the 5-in. by $2\frac{1}{2}$ -in. piece, which is in turn glued and pinned to a 6-in. by $3\frac{1}{2}$ -in. piece, thus forming the $\frac{1}{2}$ -in. rebated motif. A stop groove $\frac{1}{4}$ in. by $\frac{1}{4}$ in. is provided for the wire, and this joins a $\frac{1}{4}$ -in. hole bored through both members of the wall pad.

The groove should be covered after the bracket is wired up by a narrow strip, say $\frac{1}{2}$ in. by $\frac{1}{8}$ in. This is not necessary in the case of the pendant fitting already dealt with, as in that case the grooves were well above the eye level. Four round-headed screws are used to fix the bracket to the wall.

By the use of the joints and methods described and illustrated in this section very many items for the embellishment of the home may be contrived by the ingenious amateur and will serve as a tribute to his skill and taste. It will be noticed that all the designs are plain and simple, and a word of warning may be in season against the temptation to over-elaboration which affects so many amateurs. One sees so many fussy dust-traps formed of planted mouldings and ornaments which obscure the clean lines of construction that the restraint and restfulness of the straight line and square corner is a relief and a source of pleasure.

The amateur reading these pages and evolving his own design in keeping with suggestions shown is advised to bear this in mind.

CHAPTER XXXV

METALWORK

The working of metal, either as a hobby or as a means of executing useful repairs, does not attract so many men as does the working of wood. This is mainly due to lack of familiarity with the few simple tools needed and ignorance of the nature and properties of the common metals.

The fact is, however, that any man who can use chisel, saw and plane can easily master cold chisel, hack-saw and file. This article, besides dealing with the use of metal-working tools, will give some guidance to the beginner on the use and properties of various metals.

The use of second-hand materials

Many a time the writer has urged the old maxim that everything comes in useful once in seven years, learned in his very young days and proved by experience ever since. A dump box with all sorts of bits of metal, broken or worn out, no matter, old pots and pans of iron, steel or aluminium, will almost invariably provide the piece wanted to work up into something entirely different. Screws, nuts, bolts, washers—never should these be thrown away, old bent nails may be of no further use for wood-work, but they make rivets. Lengths of wire of all gauges, these, too, can be kept, they can be straightened out at odd moments.

Metals

The metals mostly employed in the house are few in number and simple in character. Iron, steel, brass, copper, lead, zinc, aluminium cover the list pretty well, though tin, nickel and chromium also appear in the form of plating that may affect the job to a considerable extent as will be seen.

Nature and Use of Common Metals

Cast iron

Iron comes first, with steel also as its somewhat different neighbour. Iron as employed in the house is usually cast, in which form a large proportion of odd articles can be made very cheaply. It is recognized at once when it breaks, thereby coming up for notice by the repairs man. It must be said, however, that little can be done about it, a replacement must either be bought or devised in steel. Some of these cast-iron products are now made in malleable form, and these will stand a certain amount of bending. Cast iron is brittle and cannot be bent at all, some kinds are comparatively soft and can be worked with file and drill, but not hammered, others are harder but still workable. There is likely to be a very hard outer skin on a rough casting that resists the file at first. The close crystalline grain and the grey colour of cast iron can soon be recognized. This brittleness applies in principle to almost all cast metals, brass in particular.

Steel

Steel is perhaps the most useful metal to the amateur metal-worker, in its so-called mild form it is most amenable to a variety of treatment. Mild steel is pressed into things like frying pans, stamped into an enormous variety of articles out of sheets of the metal, thick or thin, drawn into wire, nails, screws and the like. Lengths of strip from packing cases can be worked into useful repair material, hinges made from it have served many years. A good mild steel can be bent double and hammered flat without breaking.

Not all steel is like this, however, as the reader will realize. Cutting tools are made of it, so certain forms have to be able to take a degree of hardness up to the ability to scratch glass, and yet to retain properties of toughness to enable them to stand up to heavy treatment. Alloying certain other elements with the original iron provides these properties, and this science, though it does not concern us intimately, has immensely improved the qualities of cutting tools available at cheap prices to-day. Hack-saws are very much a case in point. Only experience can tell the beginner how to distinguish one kind of steel from another,

a rod of tool steel will ring, when struck, with a bell-like tone, but a similar rod of mild steel emits a dead sound in like circumstances. The latter will prove a more useful article than the former for general repairs.

Tinplate

The useful sheet metal commonly referred to as tin is really steel rolled thin and coated with a plating of tin to preserve it

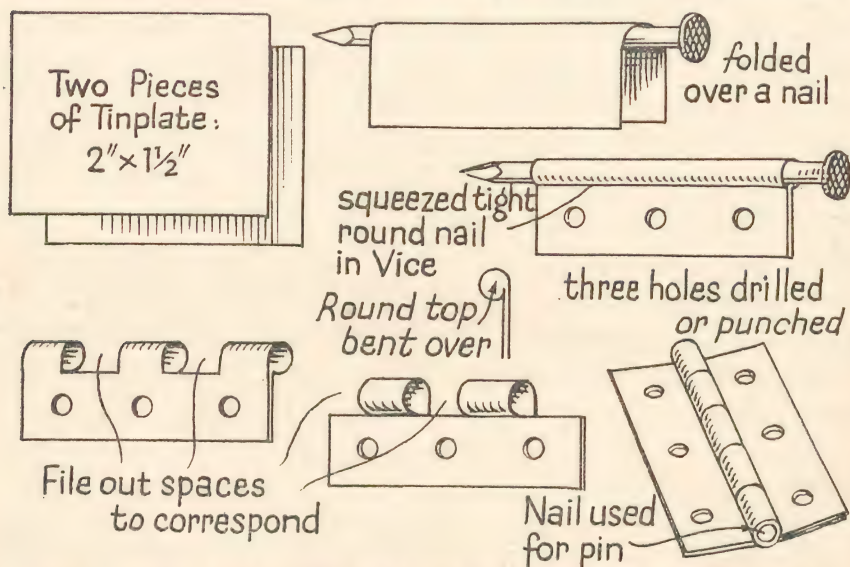


FIG. 1. USEFUL BOX HINGES THAT CAN BE MADE EASILY FROM TINPLATE

against corrosion. This is a most valuable material for all sorts of odd jobs of making and mending as it is easily soldered.

Brass

Brass, an alloy of copper and zinc, comes next, though perhaps the things made from it do not appear on the repairs list very frequently. Water taps are usually cast in this metal, and apart from replacement of washers, the only thing that ever happens to taps is the wearing away of the screwed internal parts. When this happens, the whole item is due for replacement, unless the owner is an ingenious fellow indeed, with a lathe and some useful chunks of metal in his dump box.

Cast brass is brittle and cannot be mishandled, but rolled soft brass can be treated with a certain amount of impunity, though not to the same extent as soft steel. It can be soldered quite freely.

Copper

Copper in its pure state appears sometimes, but it has a decorative quality due to its handsome colour that makes it valuable for making things of an ornamental description. Hammering copper hardens it and makes it brittle. To soften hardened copper, heat it in the direct flame and chill it in water—this process hardens steel; just in the same way, to harden copper, heat it and allow it to cool off in its own time. It solders well, though its great power to conduct heat away from the point where heat is being applied will puzzle the beginner at soldering.

Zinc

Zinc appears in its natural form in galvanized ware, as a tough protector of steel against the insidious wiles of nature in the form of rust. It is also used in sheet form for gutters and rolled into corrugated sheets for roofing sheds. It is not a very pleasant metal to work, fortunately it does not have to be worked much, but guttering repairs do have to be faced occasionally. These we shall see presently.

Aluminium

Next to steel for working qualities there is aluminium, a most valuable metal. It has just one disadvantage, and that is its refusal to accept the solder that is so useful where other metals are concerned. The beginner may get the idea that the lightness of aluminium is accompanied also by weakness, but this is not so by any means. Any old kitchen ware discarded as unrepairable still comprises a useful quantity of the metal, and should be preserved in the dump. Like copper, its value appears more where the making of things rather than their repairing is concerned, but it has its uses all the same.

This very brief mention of the materials that fall to the hand of the home metal-worker must suffice here. For the beginner who wants to know more there are plenty of moderately-priced handbooks on the subject, but as with everything else, experience will teach most of all.

Tools

Let it be quite clearly understood at once that though they may be stored in the same cabinet, wood and metal working tools

are quite different, and should be kept apart. A carpenter's hammer is a poor tool for driving a cold chisel or for riveting, and an engineer's hammer is too heavy for driving nails. It

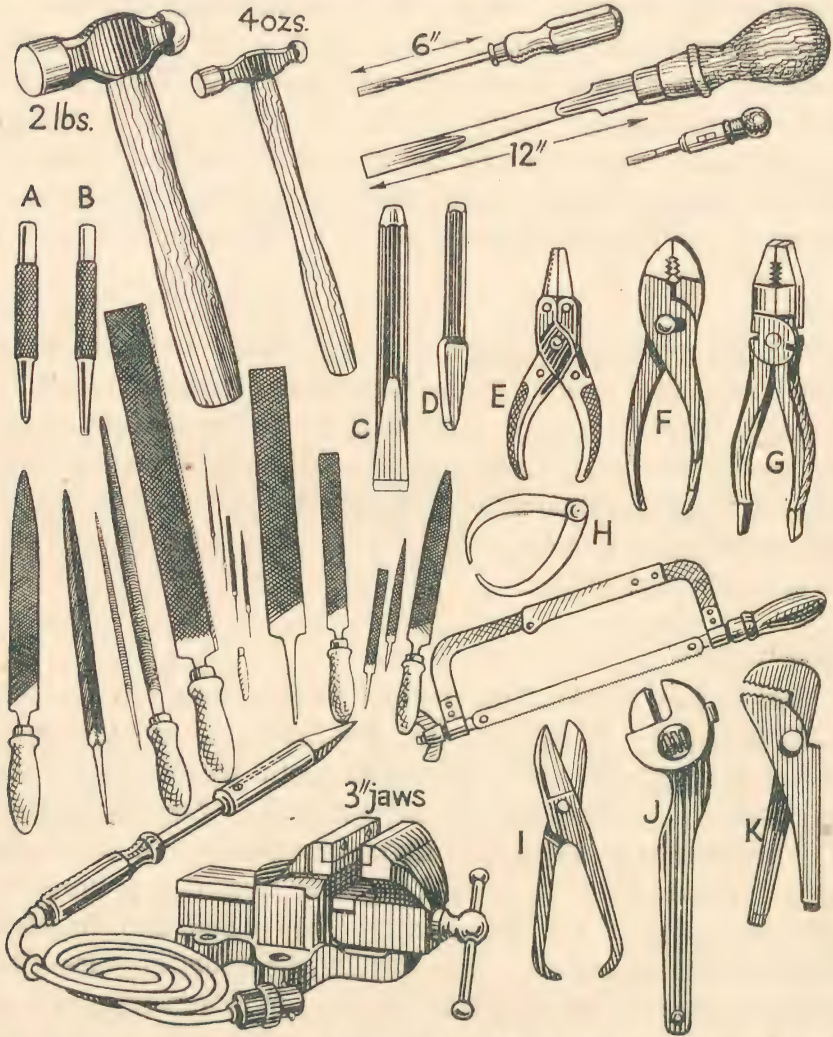


FIG. 2. A FAIRLY COMPREHENSIVE KIT OF TOOLS THAT, WITH THE ADDITION OF SOME DRILLING APPLIANCES SHOWN ON P. 133, WILL ENABLE THE HOUSEHOLDER TO UNDERTAKE ANY SORT OF GENERAL METALWORK AND REPAIRS

The tools lettered are as follows :—

- | | | |
|-----------------------|------------------------------------|--|
| A. Centre punch | E. Parallel round-nose pliers | I. Tinman's shears or 'snips' |
| B. Nail punch | F. Double-centred grips | J. Clyburn adjustable spanner, 12-in. |
| C. Cold chisel, 1-in. | G. Side-cutting square nose pliers | K. Adjustable pipe grips, "footprints" |
| D. Cross-cut chisel | H. 4-in. outside calipers | |

goes without saying that a wood saw must never touch metal, but the hack-saw is an indifferent performer on wood.

The tools required for metal working, or for the general house repairs that may be considered as coming under that heading, need not be particularly numerous. Remember, however, that

it is always easier to work with the proper tool than to make shift with something unsuitable. So, in the first place, a selection of files must be provided, the more the better. Four sizes, of varying grades, will do to begin with, these to be flats. Add to these a round, a half-round, a triangular and two or three small ones, useful for all sorts of small jobs. Here is a list of these:

One 12-in. and one 10-in. second-cut flat.

One 8-in. and one 6-in. smooth flat.

One half-round second-cut, 8-in.

One rat-tail (small round) 8-in.

One triangular 8-in.

Set of small files (carded).

Files are the hardest worked of all tools, and invariably get the worst treatment, being thrown together into the box where they ought never to be kept, and where they immediately set to work knocking the sharp edges off their neighbours' teeth. A good stout rack with only one tool in each socket is the only way to keep tools in decent working order.

A hack-saw—adjustable frame—with a dozen good blades, preferably 10-in., will take care of all the metal sawing wanted for a very long time. The hack-saw of to-day is like its predecessor only in appearance, and it can be confidently used for metal shaping out of most unlikely-looking material—of which more presently.

One of the most difficult tools to handle with real confidence, but a very useful one, is the cold chisel. It will do a good many useful jobs in the way of cutting out odd shapes, or even doing the work of the hack-saw more quickly.

The chisel wants a hammer, and it must be an engineer's ball-pane, but 2 lb. is quite heavy enough for most purposes. True, there are occasions where something heavier would be better, but if the owner has learned how to drive with a 2-pounder it should suffice. A second hammer of lighter weight, also ball-paned, comes in useful for rivetting work.

A variety of punches should be available, as these can be used on a wooden block as substitute for drilling holes, in steel or aluminium, being driven by hammer and the burr on the other side filed off. A centre-punch for locating drilling holes should be included.

Mention of drilling brings up an important question. What

sort of appliance is likely to be most useful? Many tools are available, and the hand-gearred machine is most probable as a selection, though this type is a considerable breaker of drill-bits in the hands of the beginner. There is available, to-day, a much improved type that is well worth the extra price asked for it. With these small appliances the largest hole that can be drilled is $\frac{3}{16}$ in., so if larger holes than that are required a hand-brace with drills having a square shank must be employed. Reference to the carpenter's tools as listed on p. 133 shows that a brace and twist drills are recommended, so here is a case where metal- and wood-working tools may be interchangeable.

The engineer's screwdrivers are quite suitable for wood screws, and when buying these it is a good idea to get a really big tool, say with a 12-in. blade, for one. When tackling screws that are rusted in, nothing performs better than a really heavy screwdriver, but it must not be used as a crowbar, as so frequently happens. A smaller tool with 6-in. blade makes a useful all-round screwdriver, and one of those handy little ratchet tools with a 3-in. reversible blade will always be a friend.

Pliers of the side-cutting variety, a pair of round-nose, and a pair of double-centred grips will all earn their place in the tool kit, to which may also be added a pair of "footprint" grips, useful for gripping pipework that has to be unscrewed. The pliers can be in a variety of sizes, all will be used from time to time.

Another cutting tool that is always wanted badly when it is wanted at all is a pair of "snips," more correctly, but less usually, called tinman's shears. How much pain and distress to the household scissors will be saved by this tool where tinplate needs cutting can easily be guessed. But it is wonderful what variety of useful things can be made from old food cans with snips, hammer, pliers and soldering gear.

A most valuable tool is the soldering iron, so-called because it is made of copper, so we must suppose. Every household should have one and somebody who can use it as well, neither of these propositions is a difficult one these days. There is little excuse for getting other than an electric soldering iron so long as the house has electricity laid on, but otherwise the old-fashioned bit is quite practical, though it tries the patience somewhat after using its electrically-heated counterpart. A 60-watt

size makes a good household tool able to cope with most odd jobs, and owing to the continuous heating will do quite heavy work.

Amongst the really necessary tools may be included as a final item a good strong adjustable spanner at least 12 in. long, bigger still if possible. Apart from its use for dealing with a variety of large nuts, such as those on the water-taps, it can be employed at the bench as an aid to the working of steel plate into bends and twists and the like. The Clyburn is a good useful type to get.

Such a selection of tools as we have mentioned would be quite complete enough to justify taking on a variety of household jobs, but we must also have a bench and a vice before starting out to practise. The bench is best made from such timber as builders' planks, about $1\frac{1}{4}$ in. thick, stoutly screwed together. It can be fixed across one corner of a well-built timber garage, giving a triangular bench with a long side of about 5 ft. A metal-worker's vice with 3-in. jaws will do for most jobs, but here as in other things, if the worker can provide the space, a 4-in. is better, so long as it is well and truly bolted down.

When setting up the bench, it should be fixed at a height equal to about 3 in. lower than the worker's elbow when standing, say, on the average, about 2 ft. 9 in. to 3 ft. The racks for tools, such as files, should be provided at once.

The Use of Tools

Filing

Having made this much progress, let us see about using some of the tools, and as we began the list with files, we will get a start made with those. The idea that anyone can use a file is just about as mistaken as that anyone can use a hammer, they cannot. About 1 per cent. of the people who ever use files at all really know how to use them, and more than half of the remaining per cent. think files are rubbing tools. They are cutting tools, just like saws, designed to cut in one direction only, so contact with the work should be made only in the forward direction. If they are dragged back over the surface on the return stroke, the work suffers, so do the teeth of the files, and the workman does so much more hard labour than he need.

Stand facing the vice, left foot extended and a little to the left of the vice, the right foot to the rear and in line with the vice. Grasp the file handle with knuckles downwards, and the front end between finger and thumb, the latter on top. Do not bear heavily, practice will soon show that relatively little pressure is required, and time will show also how much more life can be got out of a properly used tool. Keep on looking at the work to make sure that the set-out shape is not exceeded—even when learning always mark out an outline to which work is to be done. Never be sure that you can use a file really well until you can emulate the work of the man who can flatten two blocks of cast iron so that you can feel the air cushioned between them as they are pressed into contact, using files only. There are many tricks to learn, such as rocking the file when working on rounded surfaces, and giving a twist to a round file when enlarging a hole, or shaping sharply rounded surfaces. Practice makes perfect, and using the tools in the way they should be used goes a long step in the direction of good work.

The chisel

We said that one of the most difficult tools to use is the chisel which involves the use of a heavy hammer. Well now, this too may be described as a roughing-out tool, and it can be extremely useful for cutting away considerable lumps of unwanted metal. Until it can be struck truly hard every time without fearing for the thumb or thumb knuckles you cannot make progress. The golden rule is to keep your eye on what you intend to hit, so watch the head of the chisel, not your thumb. Look at your thumb and you will hit that quite certainly. Take a firm grasp of the chisel, and hold it so that the edge is on the work, but the bevel slightly above it, there is no need to try and force the chisel into the work with undue pressure. The hammer shaft is held in a firm grip, but let the head fly by itself once the impetus has been given to it, to maintain pressure all the way so that the forearm is still stressed when the blow is struck will give a shock to the wrist that will prove very tiring after a short spell. Relatively little practice is needed to make sure of hitting the chisel head, and in time the eye can take in the work as well as the protection of the thumb.

The chisel can also be used when working on stone or brick, and the rule for driving is equally applied when plugging holes into walls for rawhide or similar plugs.

The hack-saw

The hack-saw in use must be treated like a file and eased off the work on the return stroke, in the same way excessive pressure on the working stroke is to be avoided. Care must be taken in sawing tubes of thin metal, or teeth may be stripped, and once that happens the rest soon go, but this does not occur so freely with the new soft back saws as formerly, and need not do so at all with careful treatment. It is a most useful tool for shaping intricate work.

Drilling

Some details concerning the drilling of holes ought to be added here. The beginner will soon discover that this process can well run away with more small tools than any other, the usual form of hand-drilling brace being a somewhat clumsy affair where small drills are concerned. These drills are always made too long for such applications, and it is as well to learn how to put new points on them. A new drill of $\frac{1}{16}$ -in. diameter is about $2\frac{1}{2}$ in. long, it will bow out under pressure and break off very easily. Such drills must run at very high speed to cut safely, and little pressure is needed if speed is available, but speed is not available with a hand-gearred brace, so undue pressure is applied. This, with the uneven motion due to the hand-crank, soon breaks all the small drills. The remedy is to break an inch off the fluted part and grind a new point. Using a larger drill as a model, this can be done with a carborundum or similar grinding slip. During the war years, when drills were not to be had, the writer kept his stock up by begging broken drill stumps from a local munition factory and re-pointing them in this way.

A new drill brace is now available on the market giving a much smoother action and higher speed, but even so it does not compare with the speeds at which the machines run in engineering factories. There a $\frac{1}{16}$ -in. drill may be run at 2,000–3,000

revolutions a minute with no risk of breakage. Drills the workman must have, amateur or professional, so any method of employing them economically is worth studying.

Never attempt to drill a hole in any metal without first exactly locating the spot by means of a centre punch with a point kept well sharpened. Apart from securing that the hole goes exactly where it is wanted, the punch mark takes a load off the drill point, which is not designed to cut a way for itself.

Countersinking a hole is necessary where riveting is to be done, this provides a recess that the rivet fills up when its head is formed by the hammer, giving a stronger hold. The recessing can be done with a drill several sizes larger, but countersinking bits can be had somewhat similar to, but of harder steel than, those used for the same work in wood.

Screws

No mention has yet been made of a most important matter that sooner or later will bring the amateur repair man up against an obstacle. We refer to the question of screws and screwthreads generally. These invaluable aids to the tight fixing of all sorts of things mechanical are all very well so long as they remain in order, but unfortunately this is by no means a regular habit. They work loose—nobody knows how—and drop out, they rust solid with their nuts, so when they have to be separated they break apart, one way or another they get written off and must be replaced. Sometimes this is easy, other times not so, the thread may be something quite unknown, not surprising when it is realized how many national standards there are in this business of screw cutting. Even in Great Britain we have Whitworth's in two classes, British Association, and Cycle Standard, these with pipe threads, will almost certainly be present in most households, all incipient sources of trouble.

A set of screwing tackle is an expensive outfit if it is to cover all eventualities, so is not to be thought of. A reduced set of Whitworth standard tackle for screws from $\frac{1}{8}$ in. up to $\frac{5}{16}$ in., comprising dies for cutting threads on bolts and screws, and taps for threading the holes in nuts or the parts into which the screws must go, will not be out of place in the workshop. There is a fascination about this sort of work that will most undoubtedly

lead the owner into making things that require screws in quantity! The writer made an electric clock in response to such an urge, the screwing tackle was, however, of the British Association standard, usually employed in clocks and electrical gear. This is a useful standard, but it is based upon metric measurements; however, it is close to many cycle threads, and has proved very useful through the years. Screws and nuts can be made to match, and that is all that is usually needed, so

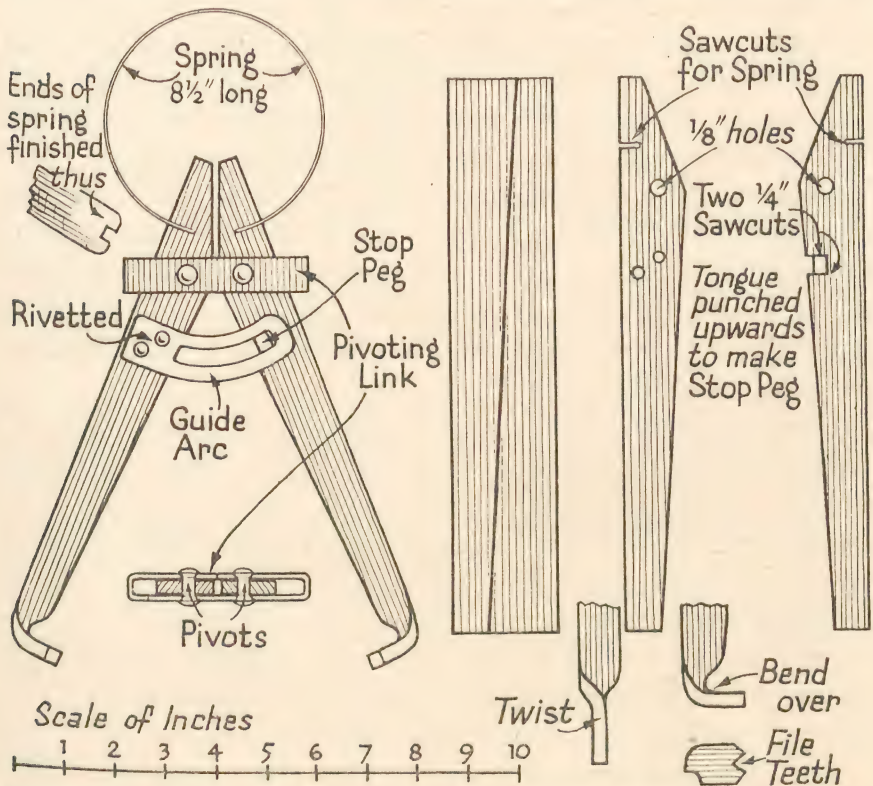


FIG. 3. MAKING THESE COAL-TONGS WILL PROVIDE USEFUL INSTRUCTION IN HANDLING METAL WORKING TOOLS

the choice can be left to the reader to decide when confronted with prices. Be sure the gear will prove its worth in time.

Making a Pair of Coal Tongs

Having dealt very briefly with the kit of tools and how to use them, let us now set about making something useful by way of an example. Useful, yet simple in construction, its making calls for just a little skill. The original was made by the writer

from old metal off a scrap dump, but a suitable piece can be obtained at any iron merchants, or even sawn out of a piece of rusted structural steel. A pair of fireside coal tongs of unusual design has been selected, it calls for sawing, filing, drilling, riveting, and is made from a piece of $\frac{1}{8}$ -in. thick steel plate, a small quantity of thinner plate and a length of stout flat spring taken from an old gramophone motor. The drawing shows the arrangement of parts, from which it can be seen that the two arms can be cut from plate 1 in. wide and 10 in. long. Actually they were sawn from one piece $1\frac{3}{4}$ in. wide, cutting across at an angle as shown. The finished shape of each is clearly indicated, they can be sawn entirely, then clamped together in the vice to be finished by filing. Holes are marked out, and each one located exactly with a centre punch, a hammer blow making an indentation that will hold the point of the drill at the start. One arm has two holes $\frac{1}{8}$ in. diameter for riveting the guide arc of thin plate filed out as shown. This is marked out on the plate and holes being drilled at intervals, the slot is finished with the rat-tail file.

Each arm has a $\frac{1}{8}$ -in. hole for its pivot, and the other one will be given two saw cuts $\frac{1}{4}$ in. apart and $\frac{5}{16}$ in. deep at the place marked. The metal intervening between the cuts is punched up at right angles to form a projecting peg, the purpose of which is to run in the curved slot on the first arm.

Before assembling, the narrow ends of both arms are given a twist at right angles, 1 in. from the ends, and then bent over as shown to form jaws that can be filed with sharp teeth. This twisting can be done with the big adjustable spanner.

Saw cuts are made 1 in. from the top of the arms into which the ends of the spring are pressed, but not until assembly is complete. The pivoting strap is made from metal $\frac{1}{2}$ in. wide, carefully bent and drilled with the holes 1 in. apart. Rivets can be cut from old nails that fit as closely as possible into the holes, a driving fit is good, and with a light hammer burr the heads over so they cannot drop out. Secure the guide arc in the same way, taking care that the peg slides freely in the slot.

The spring is 10 in. of old gramophone motor spring, by heating half an inch of each end to redness in the gas flame and allowing it to cool off, it will be soft enough to enable a file to cut a slot $\frac{1}{8}$ in. wide and $\frac{3}{16}$ in. deep in each end. These slots

can be pushed home into the saw cuts made for them at the tops of the arms.

This article, when made, will give good service and some pride to the maker if he is a beginner and perhaps to the expert as well. There is plenty of use for tools in it, and once it is at work the maker will want to think up some other contrivances to keep it company, which is exactly right. We have had trouble with the latch bars of our casement windows, originally made of cast brass, two or three of them have been broken and replaced from steel similar to that used in the tongs. Hardly anyone would realize they were not the original fittings.

Mention of casement windows will remind many people of the usual disadvantage of this type, in that the least opening of these is often much too wide in strong winter winds, especially in bedrooms. A

simple additional latch can easily be contrived to hold the window open by only a narrow chink. Such a device is illustrated.

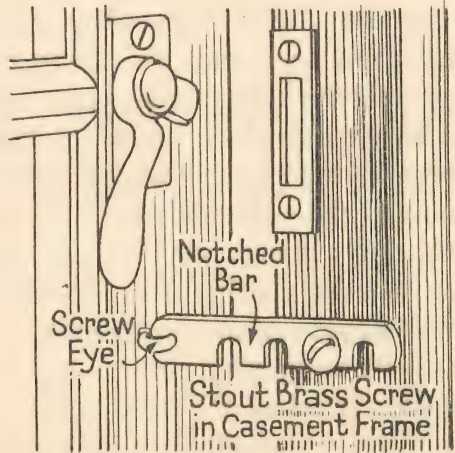


FIG. 4. A USEFUL DEVICE FOR LIMITING THE OPENING OF CASEMENT WINDOWS

Soldering

We must now return to our toolbox. The soldering outfit calls for some explanation, though in these days of electric irons and cored solder there is very little difficulty in the job. Unfortunately neither cast iron nor aluminium is freely solderable, the latter metal not at all by lead solders, which is tiresome, but there it is.

The one great rule to be observed in soldering is cleanliness of the parts to be joined as well as the point of the iron. Take no notice whatever of claims for various fluxes that they permit the soldering of dirty metals, no reliance can be placed on such joints as compared with those made properly with clean metal.

First let us deal with the simple iron that is not self-heating. A blow-lamp is a good heater, but not everyone has got that useful piece of gear, the kitchen stove does it next best, but it is a trifle wasteful of gas, and, finally, the domestic grate is the worst of all. Whichever method is used, remember that the copper bit has to be cleaned and run over with solder—known as tinning—before being brought to the work. Heating in the gas flame is carried on until a green tinge is visible in the surrounding flame, the bit is then hot enough, it is taken off, the oxide—or dirt—brushed quickly with a wire brush and rubbed over with some solder, preferably of the cored sort. This is obtainable everywhere now and is most convenient as the flux is in the solder itself. It is not suitable for zinc, but will do for every other metal that can be soldered. If ordinary solder is used, it must first be dipped into whatever flux is available, several proprietary mixtures are on the market.

When the solder flows over the copper point it can be applied with a firm pressure to the metal, which has been cleaned brightly and smeared with a very little flux. Unless the quantity of solder required is considerable, there is no need to apply the stick of it to the job, enough can be carried on the point of the bit. If the joint is an extensive one, the job should be firmly clamped down so as to leave both hands free, and additional solder can be fed in continuously so long as the heat is sufficient to keep it running. A porous state in the soldered joint is partly the result of carrying on too long without re-heating.

Once the job is completed, all that is necessary is to scour off all traces of flux, and if the solder is lumpy, or uneven, it can be smoothed off with the point of the heated bit, much better finish is got this way than by filing it smooth.

Really that is all there is in soldering, as quite a moderate amount of practice will show. It is no use trying to persuade solder over rust or other oxidised spots, it will never take hold, no matter how it be coaxed. Scrape the rust away, down to bright metal, and the job is done at once. Copper needs a hot iron, the nature of the metal is to conduct heat so fast that it flows away from the bit before the solder has time to melt, but when the whole job has heated up, the conduction slows down and the solder runs. The parts must be held in firm contact for longer than with other metals till it is quite clear that the solder

has set. Experience will tell when this happens, the various changes can be watched until a quick overcast of a cloudy effect takes place, quite unmistakable, this indicates setting.

With the electric iron all heating troubles are at an end, and consequent risk of a dirty bit through oxidizing. Work is carried on continuously without pauses for re-heating the bit and cooling the work, so a job that would take half an hour with ordinary bit and simple solder is done in ten minutes or less with electrical heating and cored solder. A 60-watt iron will run continuously for 16 hours on one unit of current, cheap enough, if anybody wanted to do such a long job, and at a cost quite unnoticeable for ordinary casual kettle-mendings and the like.

So many kitchen utensils are made of tinplate and wire, soldered together in flimsy fashion, that we make no apology for the suggestion that they could often be given a new lease of long life by a touch of solder applied by someone who was not quite so hurried as the original tinsmiths.

A very tiresome job of work is the repair by soldering of cracked zinc guttering. The only way to tackle it is with a blow-lamp, but with a specially long flexible connection the electric iron can be brought on to the job, as the current is no more than required by a medium lamp, so a lamp socket can be used from the nearest room. Zinc requires special treatment as far as fluxing the parts is concerned. The best stuff for this purpose is called "killed spirits," which consists of hydrochloric acid (spirits of salts) in which metallic zinc has been dissolved till it will take no more. It is then zinc chloride of course. Sometimes a little pure acid can be added, but there is always a risk of corroding the metal to be soldered, and it is better to use the chloride if possible. Quite frankly, gutter repairing is an awkward and tiresome job, but an electric iron and a patient operator will do it in the end.

Soldering lead is tricky too, the surfaces are scraped bright and rubbed with hard tallow, a very soft fusible solder must be employed.

The process known as sweating is used when securing unions on to pipes. In this case solder has to be run inside the union before sliding it on to the pipe. To assist such a process a most useful aid is an iron dish or spoon with a quantity of solder in it that can be melted over the fire, the article being dipped—after

cleaning and fluxing—at the end of a piece of wire. We have found this method to be very useful when securing nipples on to the wires for cycle cable brakes, a very secure joint being assured. The parts being cleaned in petrol, fluxed and put together, the ends of the cable being turned over to keep the nipple on, the assembly is dipped into the molten solder. That is all, when withdrawn and cooled, a firm union has been made, though a spot of solder can be applied over the head to complete the job.

For general information it should be noted that without special appliances brazing is not practicable to the average householder repair man. Many model-makers do it, certainly, with steam-boilers for their engines, but the heat required is far above that needed for soldering and can only be obtained from a powerful blow-lamp. The process consists in melting soft brass between the points or surfaces to be joined—such as the tubes and lugs of a bicycle—borax being used as flux.

The repairing of kitchen utensils is certainly work that will be called for sooner or later. Kettles, enamel ware, cooking pans, all develop leaks after years of service, even though the greater part of the article is no worse than it ever was. Tin-ware is easily dealt with by soldering, but enamel ware is not, neither is the ubiquitous aluminium. The enamel bowl in the kitchen sink can easily be repaired if the tiny leak-hole is tackled at once. Small rivets of aluminium can be made—or bought—and the hole carefully enlarged to provide a push fit for the rivet. With care, and a light hammer, good flat heads can be formed on both sides and a perfectly water-tight closure made. Enamelled kettles, as well as those of aluminium, can be repaired with small aluminium screws and nuts, the screw head being outside, and a thin leather washer under the nut inside makes sure of a tight water seal to resist heat. This same method has been applied in the case of galvanized boilers, and once a good seal has been made it can be forgotten.

These methods have all been applied and proved as a result of the hard testing of war-time when replacements were not to be had and repairs had to be made. So long as the sealing is done with a non-rusting metal it will last for years.

Another tiresome repair that has to be made from time to time is to the spring in the door-lock. When it can be replaced,

all well and good, but when there is difficulty, an excellent substitute can be contrived from a short length of the spring-wire used for hanging curtains. The application involves drilling two small holes in the parts and a little bit of bent wire, but once fitted, this type of spring will last as long as the lock. The drawing shows the lock and the parts concerned. Several such locks have had their broken springs thus repaired and have given no further trouble after seven years of service. Apart from this,

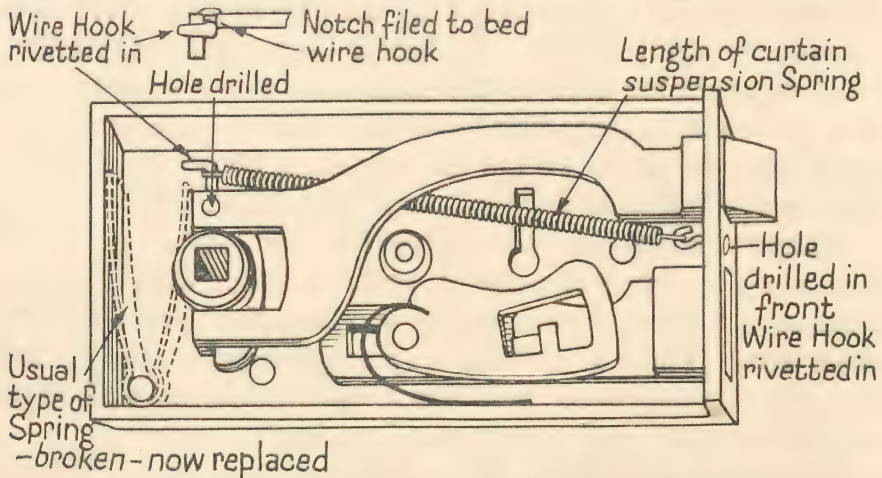


FIG. 5. A PERMANENT REPAIR TO A DOOR LOCK SPRING

few things ever happen to the lock that gets an occasional spot of oil, as every lock should, two or three times a year, though graphite greasing will last for ever, following a strip-down.

Such repairs as these and others previously mentioned will come easily to the metal-worker with a few tools, a dump box and a little thought and ingenuity. Much satisfaction can and will be derived from contemplation of these repairs, especially when they prolong the life of useful gear, and more particularly so where the repair is a definite improvement upon the original design, as it may very well be.

CHAPTER XXXVI

UPHOLSTERY AND SOFT FURNISHINGS

The upholstery and soft furnishings of the home play such an important part in its appearance, no less than in its comfort, that a knowledge of the processes involved in their repair and maintenance is invaluable both to the handyman and housewife. In fact, looking after these items may be considered as a combined operation; the sewing skill of the lady of the house, allied to the more robust talents of the handyman, are both necessary.

Throughout this chapter instruction and explanation have been made as simple as possible, and it is hoped that, with the diagrams provided, readers may be encouraged to tackle the jobs dealt with. There is nothing very complicated in any of the methods recommended, and much satisfaction, as well as a considerable saving of money, may be gained.

The tools required, with the exception of two or three special types of needles, will usually be found in the household tool kit.

First, then, here is a list of tools and materials.

General tools

Hammer, screwdriver, gimlet, bradawl, and tack-remover. Web-stretcher, ordinary sewing equipment, including cutting-out shears and tailor's chalk.

Special Needles (see illustrations)

- (a) Carpet needle.
- (b) Mattress needle for blind stitching.
- (c) Packing needle for coarse foundation materials.
- (d) Curved needle for stiff edges.

Foundation Materials, etc.

Tarpaulin, hessian, unbleached calico, downproof calico, ticking, webbing, stitching twine, upholsterer's twine, wire spiral springs, nails, tacks and screw nails, set square, ruler, drawing pins.

Padding and stuffing materials

Flock, coconut and Algerian fibres, draper's wadding by the yard, kapok, eider-down and feathers.

REPAIRS

Settee and chairs

Seat

The hessian cover, the webbing or the springs become worn and broken, and if left much damage is soon done, not only

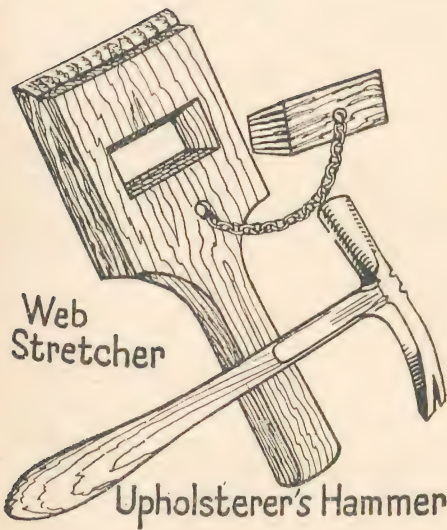


FIG. 1

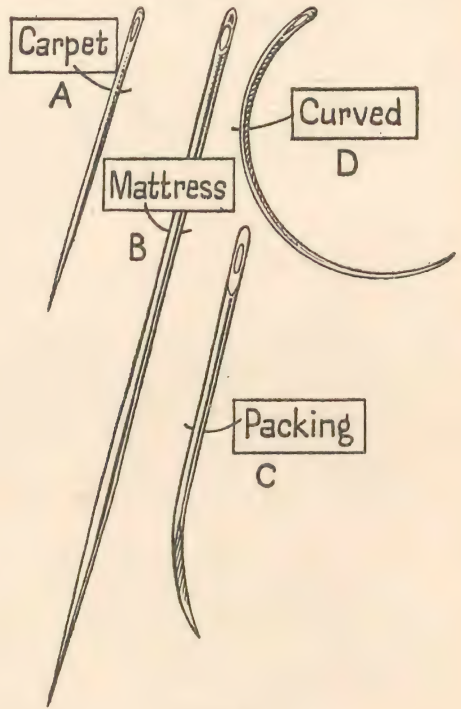


FIG. 2

causing great discomfort but even necessitating complete reseating. It pays therefore to give the chair prompt attention.

Sagging webbing

This often splits from the pressure of springs and general wear. To repair it, turn a Chesterfield upside down, or a chair bottom up on a table, and release the hessian cover where necessary. Now unpick the stitches attaching the springs to the webbing, remove the damaged webbing entirely and replace with new in exactly the same position. Stretch well with a web

stretcher, turning in $\frac{1}{2}$ in. at the ends before securing with nails, then sew the springs to the new webbing, using a curved needle and twine. Tie the ends securely with a reef knot before replacing the hessian cover.

Broken springs

First of all release the hessian cover and webbing where necessary, unstitching the broken spring, and replacing with a new one of the correct size in exactly the same position. Sew and tie securely as before.

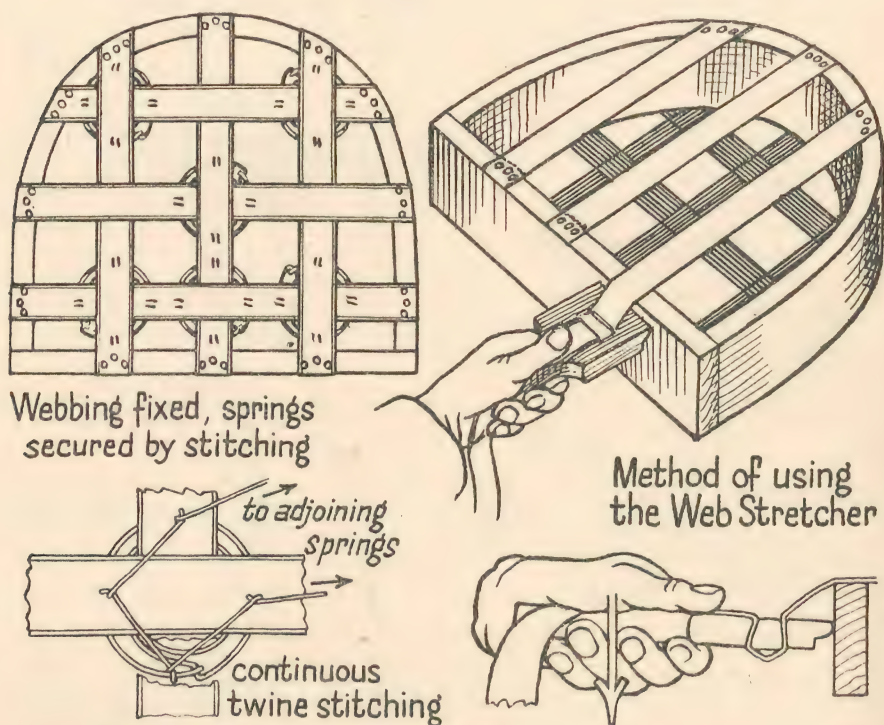


FIG. 3

The hessian cover

If this cover is only partly worn or cut it may merely require a patch, but the webbing underneath must be removed where necessary, also the sewing of springs unpicked, then the patch may be fixed and sewn to the hessian, using twine and a curved needle. If badly worn it is best to remove the whole cover, replacing it with a new one, fastened on in exactly the same position as before.

Loose trimmings

As these often cover vital joints they are not only a decoration but a protection as well. It is wise to notice the first trace of loose gimp, pipings, or braid, and to mend the faulty portion with nails, or by sewing at once. This saves a great deal of trouble later on.

Small loose covers

For the arms and back of a chair, made of an unobtrusive material, preferably washable, these lengthen the life and improve the appearance of a soiled or shabby upholstered chair. Sometimes when having a suite upholstered, loose pieces of matching material can be made for the arms and back without any detriment to the appearance, especially if the arm pieces are made long enough to tuck in well at the seat.

CARPET REPAIRS

Much use may be made of good parts of carpets if they are joined and bound correctly, or a seamed carpet will last longer if the seams are unpicked and the shabby widths sewn together again and placed where they will not be seen, or have much wear. If the edges have worn thin, strengthen them as shown in the diagram before rejoining.

Joins

It is very important to understand the two types of threads used in woven materials. WARP or selvedge threads go down the length of materials and carpets and are the stronger threads, whilst the WEFT threads go across from selvedge to selvedge, are less strong and inclined to stretch more easily. To join *warp edges* fray out both edges $\frac{3}{4}$ in., twist the frayed ends into groups of about six, press back and back-stitch each group down on to the carpet using strong thread and a carpet needle, stitching twice to make the work quite strong. Oversew the edges closely together on the wrong side, keeping the pile out of the way, and keeping the carpet quite flat, then fasten the ends very securely and press well on the wrong side with a damp cloth and a heavy iron.

To join *weft edges* of partly worn carpet it is best to strengthen both edges first with carpet tape by loop stitch at the outer edge, and hemming flat at the other edge, as illustrated. Now oversee the edges together with carpet twine and press well as before.

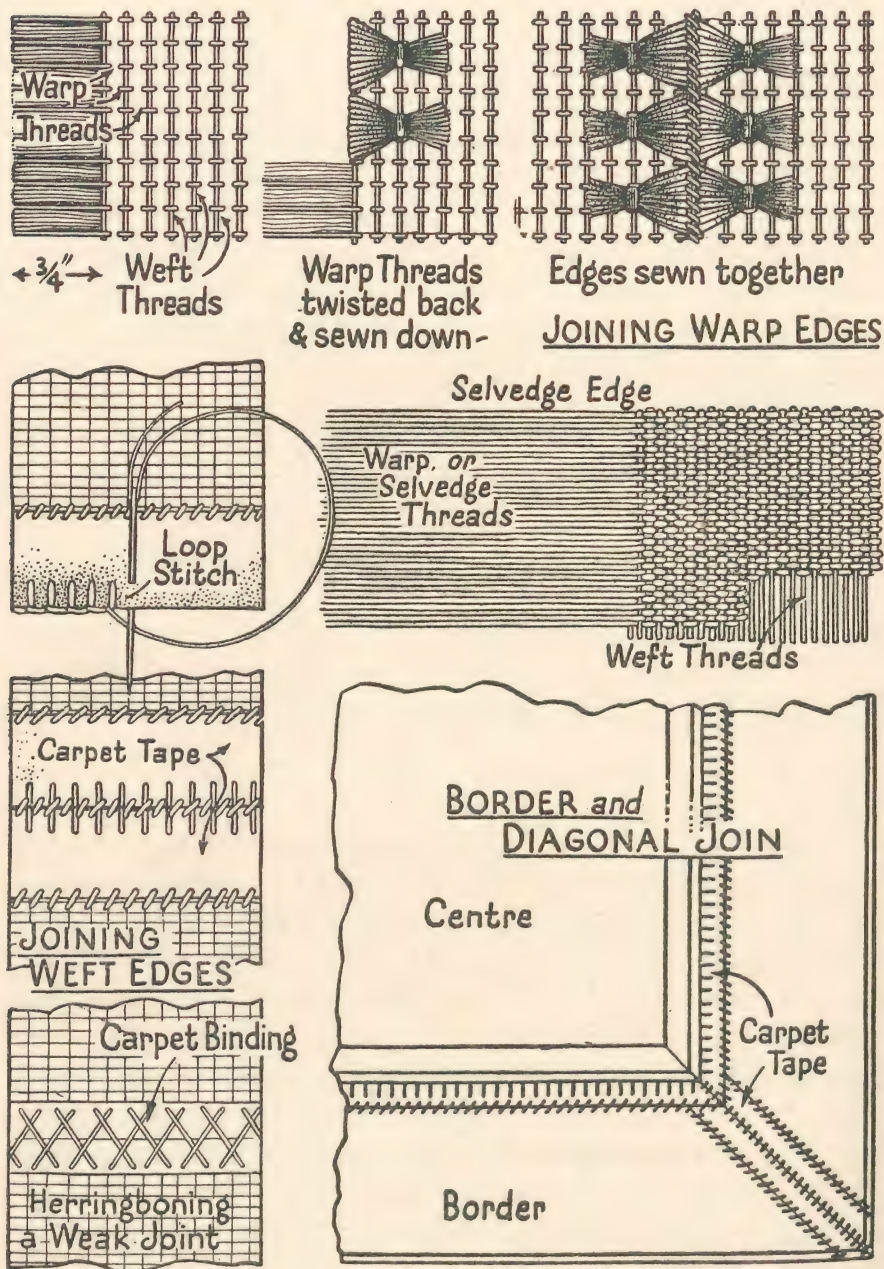


FIG. 4

To patch a hole

First of all trim the edges of the hole straight, and prepare in the same way as the weft edge, join with carpet tape. Cut a patch from the good parts exactly to fit the trimmed hole, prepare the edges in the same way, press well, and test the patch to see it fits into the hole exactly. Oversew the patch closely to all four sides of the hole, on the wrong side, and press again when finished.

If a patterned carpet, match the pattern with the patch if possible, and on a pile carpet, if the work is neatly executed, it need not show at all on the right side. If you are unable to match the pattern, choose the nearest colour to make as unobtrusive as possible, and change the position of the carpet in the room if possible.

Fireplace

To equalize the wear of a carpet it should be changed round periodically. Do not cut carpets at the fireplace if possible, but if unavoidable, oversew the cut edges, strengthen with binding, turn back the spare piece, tuck it under, and cover with a hearth rug. It will then be possible to change the carpet round by joining this piece up again, cleaning any soiled part with carpet soap, and pressing the join flat on the wrong side.

A weak join

Sometimes the thread used to join the strips of carpet wears thin and the join works loose. This may easily be strengthened by fixing carpet binding over it on the wrong side and herring-boning it down flat with twine right down the centre, as shown in the diagram.

Borders and diagonal joins

Quite attractive and strong bedroom rugs may be made from a larger worn carpet, using good border pieces and a plain centre.

Cut the border ends diagonally, strengthen with carpet tape as for weft edge joins, oversew them together, and strengthen the cut edge all round with binding. Cut, prepare, and join the centre piece in exactly the same way as a patch, but to prevent puckering join two opposite sides first.

Sometimes a very pleasing effect is given by joining the good parts of two carpets in contrasting colours, or two matching border pieces joined down the centre and bound at the ends will make an excellent bedside or nursery rug.

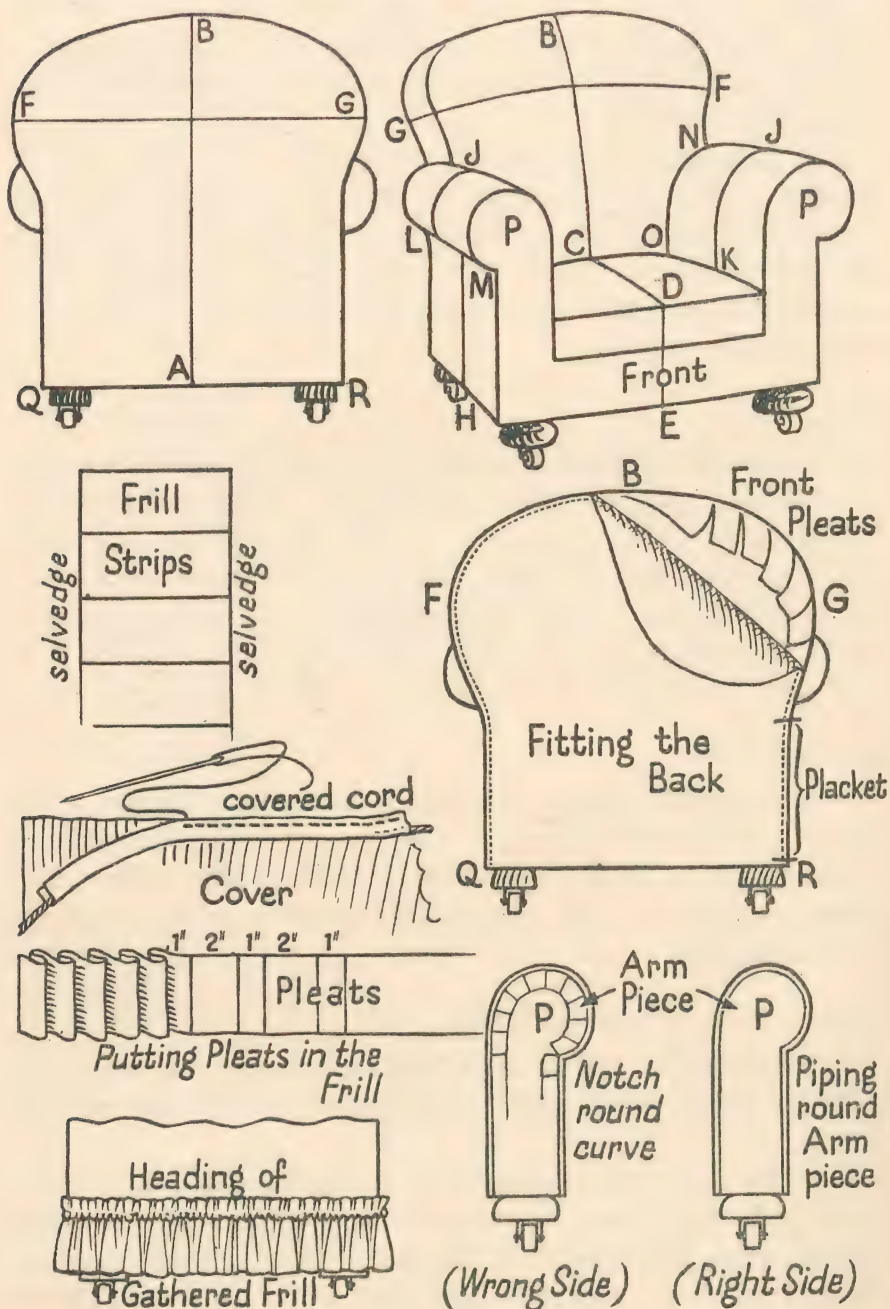


FIG. 5

LOOSE COVERS

When dealing with soft furnishings as a general rule, selvedge threads and designs go from top to bottom or from front to back of seats, but always down in frills, to ensure graceful folds. It is best for the learner to choose simple methods first, and to facilitate laundering leave loose covers unjoined at the seat "tuck in."

With care, patience, average sewing knowledge, and only cost of material, you can then make loose covers yourself, from the following instructions and diagrams.

Choice of materials

There is a wide range suitable such as cretonne, printed linen, chintz, heavy casement, furnishing tweed, jaspé, holland, etc. A closely woven and heavy curtain material can be quite as suitable as upholstery fabric and gives a wider range of choice, but any suitable material, closely enough woven to prevent dirt penetrating through, will give good results.

Measuring a chair

A shaped chair is chosen for the illustration because it is the most difficult to handle. If you can manage this type, the rather "square" modern style will be simple.

Place a pin at the highest point of the centre back, B, and take two measurements.

- (i) Start from the floor A, take the tape measure up to B, over the back of the chair to C, tuck in 6 in., go on over to D and down to E. This gives the total length of material required for the back and seat from floor level to floor level. For the width, measure from F to G, and allow 1 in. for turnings.
- (ii) For the arm measurements, start from the floor level at H, take the tape measure into the curves up to J, over the arm to K, tuck in 6 in., double this length measurement, allowing for two arms. For the width, measure the widest part from L to M.

As a rule single width material cuts to less waste, but if using double width for a straight lined "square" chair, one set

of arm pieces can be cut from the same width as the back and seat, allowing the extra from the second arm pieces for the frill and any spare cushions you wish to make.

For a frill

Allow at least $1\frac{1}{2}$ times round the bottom width of the chair, decide the depth of frill needed to suit the style chosen, and join as many strips as required, allowing $\frac{1}{2}$ yard extra for safety. If using a soft self-coloured casement, allow twice round the bottom width for a *very* full frill.

Cutting out

Always keep the pattern of the material straight down the centre, right way up, stripes, etc. matching as far as possible, mark carefully with chalk, and check before cutting.

Front and back

Pin one end of the material, pleating at the curves along the top of the back from F through B to G. Tuck the centre well down at C, keeping the pattern quite straight, and tuck in between the back and arm from O to N. Now lift the material off, mark with chalk on the wrong side in the creases, allowing 6 in. to tuck in at the seat, and 1 in. turnings from O to N. Fold down the centre from B to C to make both sides alike and cut out.

If dealing with a well-used chair, which has lost its symmetrical shape through use, allow for this by fitting each side separately.

Arm and seat pieces

It is necessary that these pieces should match. If using a one-way material, join under the curve L M, otherwise allow 6 in. tuck in at the seat, 1 in. at O N, and take the material right over the arm down to the floor level at H. Proceed in the same way for the seat allowing 6 in. tuck in at the sides and back, good turnings for the front piece and fittings generally, and keeping the pattern vertical down the centre of each piece. A paper pattern may be made of the front arm piece P, if

preferred, before cutting out in the material, as the fitting of this piece is very important.

The back

Pin the material on to the front piece from F, B to G, shaping it carefully to fit the chair, and continue at the sides down to the floor or frill level, leaving good turnings for fitting all over, and for the placket, as shown in the diagram.

To fit and make up

Covers should fit well but not tightly, allowing for possible shrinkage in washing. To ensure any design being absolutely straight, mark the centre line in every piece with a contrasting thread. Correct and trim all pieces after fitting, leaving even turnings, as a guide for straight machining.

Fit the top of the back piece first, right side out, placing centre to centre at B, pin round from F to G and when correct remove from the chair, turn, tack and machine from F to G.

Arms and seat

Fit and correct carefully on the right side, adjusting the 6 in. tuck in at the seat, remove, turn, tack and machine, joining to the back pieces from O to N.

Front

If using one way material this must be joined to keep the material the right way up, or to introduce piping if used. In any case fit this piece accurately to the seat and arm pieces and proceed as before.

Back

Place the whole cover on the chair, tuck carefully into position at the seat, fit together from F to Q, and G to R, allowing a good placket, to prevent any fear of tearing when removing for laundering or cleaning. Measure from the floor round the bottom with a ruler, mark with chalk, trim level, allowing turnings either for a hem or frill.

Piping cord

This is used both as a decoration and to strengthen at the seams. If using it, it is advisable to shrink the cord first by boiling to prevent it puckering when the cover is laundered.

Covering piping cord

Use 2 in. wide strips of material, on the straight or cross, to match, or contrasting, according to your colour scheme. Place the cord down the centre, fold the strip over, and tack close to the cord with the raw edges together, as shown in the diagram.

Fixing piping cord

Place on the right side of the piece to be piped, with the raw edges together. Now place the second piece to be joined on top of the cord, raw edges together again, tack in position and machine close to the piping, using a special machine presser-foot attachment. For the curves, use crossway strips, well notched, to give a good fit. Piping is also often inserted between the bottom of the cover and the frill, giving added strength to bear the extra weight of the frill.

Placket

Fasten back 1 in. turnings and secure with hooks and eyes or upholstery press studs, fastening the side piece over the back to avoid unsightly gaps. Fasten press studs before passing through the wringer when laundering to avoid damage.

Frill

This is a matter of individual taste, to suit the style of the room and material chosen, but it is almost always an improvement.

Join the strips with flat open seams to make one long strip, machine a narrow bottom hem, divide the cover and frill into four, starting from the placket gather the frill in four portions, regulate and fix on the wrong side of the cover each quarter separately, then tack carefully and machine. For the beginner not using piping, turn the top of the frill down $\frac{1}{2}$ in., gather through the turning, and fix flat on the right side of the cover to form a heading. This is a very effective method. The illustration shows how to do a pleated frill.

Neatening inside

To avoid fraying when washing it is well worth while to over-sew all raw edges with strong thread, and to strengthen joins, seams and corners. This greatly lengthens the life of loose covers and prevents splitting with hard wear.

For the car

Loose covers of washing cretonne or casement, etc. for car seats may be made in much the same way. The simplest plan is to make one cover for the back, leaving several inches to tuck in under the seat, but making it fit closely round the back. Make a separate cover for the seat, putting in a shaped side piece to fit, and tuck underneath. Thread a tape draw string through the hem and tie the seat cover on. Tuck the back cover down and keep in position with the seat on top. Made in this way covers are quickly removed for washing.

LOOSE UPHOLSTERED CUSHIONS

These are very practical, as they are kept in good condition more easily than fixed upholstery, and may be made at home to fit existing chairs, chests, or a window seat by carrying out the following instructions.

Materials required

Choose a strong ticking to hold the filling, and any suitable soft furnishing material, to match or blend with those already in the room, for the covers.

Fillings

Horsehair is the best in quality and wears well, without becoming lumpy, flock is less expensive and if of good quality, and well tufted lasts a long time without wearing thin and uneven. Lastly, there is Algerian fibre, which is the cheapest but is quite suitable, for it springs up again after being flattened in use.

As a rough estimate allow about one pound of filling to every square foot.

Measurements

Unlike loose covers, an accurate paper pattern may be made by placing large joined newspapers on the seat and creasing them exactly to fit, then cutting out along the creases. To calculate the ticking required measure the length from A to B, in the

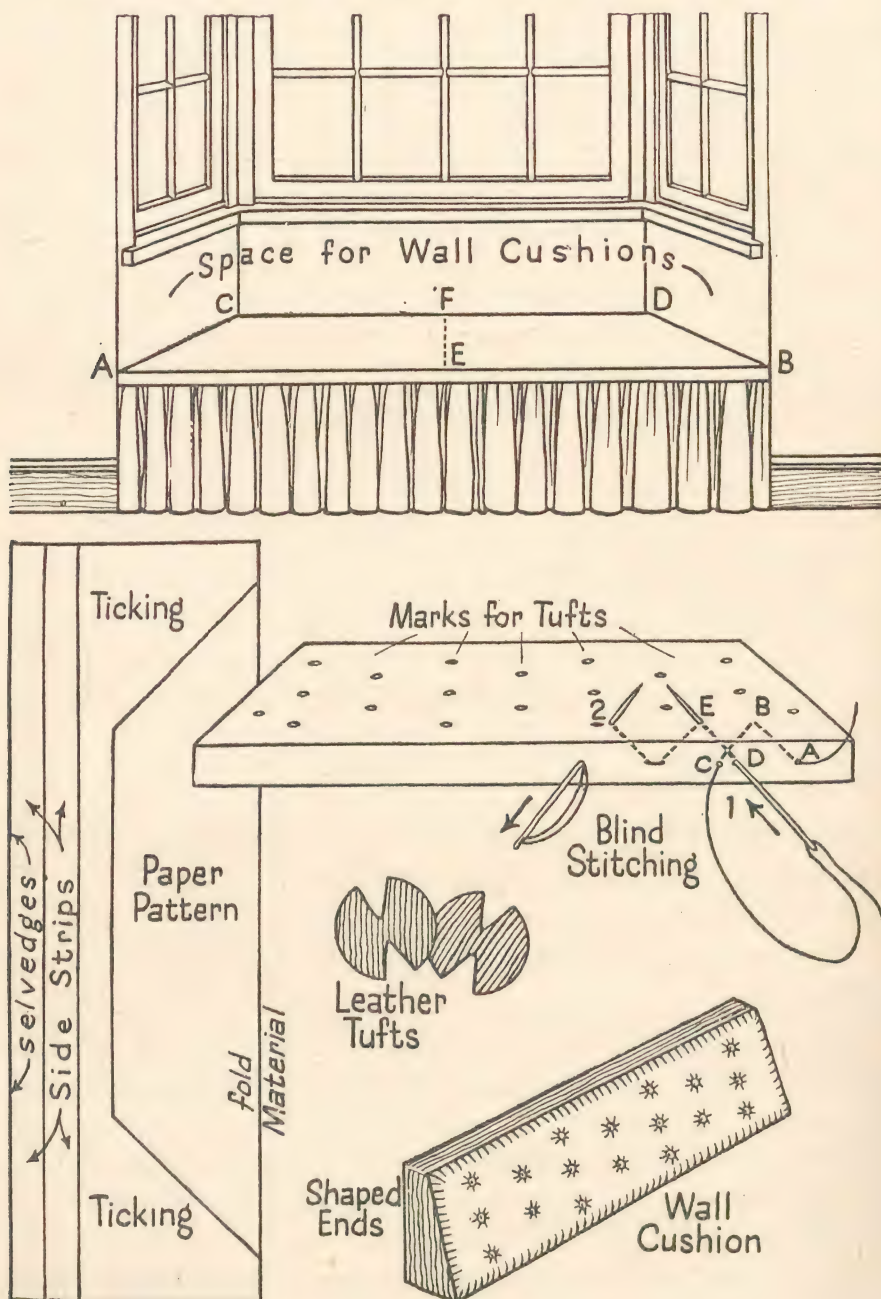


FIG. 6

illustration, the width from E to F, double it, allowing one inch extra per foot for tying down, and $\frac{1}{2}$ -in. turnings. Decide on the depth required for the side strip, roughly 3 in., then measure from E to B, B to D, and D to F, double it and allow 4 in. extra for joins if needed.

Covers

If the seat cushion only is to be covered measure as for the ticking, but if a frill or valence is required, measure from A to B, allow half as much again, and for the depth, from the front edge of the seat to the floor level, allowing for a narrow hem. Place and join as for the chair frill, with selvedge threads going down, to ensure a graceful "hang" with the pattern the right way up.

Cutting out

Place the pattern on double ticking, at the edge to avoid waste, allow the correct turnings and cut out, cutting the side strips very accurately to the measurements along the selvedge threads. If the covers are of a patterned material, cut with designs going from the front of the seat to the back, and from bottom to top of the frill. Otherwise place the pattern on double material and cut out as for the ticking.

To make up the ticking

Mark the position for the tufts on the top and bottom pieces of ticking $2\frac{1}{2}$ in. from the edge, and 4 in. to 6 in. apart, on the right side. Join the side strips together on the wrong side, with flat, open seams, tack on the wrong side to the seat piece from B to D, D to C, and C to A and machine, making the last join of the side strip fit exactly at right angles to the seat piece.

Join the other edge of the side strip to the second seat piece in the same way, leaving an opening at the back for filling.

To fill

Turn the ticking cover the right side out, pushing out the corners, lay flat on a table and insert the filling chosen, stuffing thoroughly, right up into the corners. Sew up the opening with a curved needle and strong thread and distribute the filling evenly, making a firm but not hard cushion.

Blind stitching

This stitch forms loops to keep the filling in position at the edges, where the cushion flattens most easily. Using thin twine and a long upholstery needle, push it in about 4 in. from the corner, in the middle of the side strip at A, leave an end to tie later, and bring the needle out only as far as the edge, then slope to the right, push it back, eye first, through the centre of the side piece 4 in. to the left of the previous stitch. Now insert the needle into the side piece again $\frac{1}{2}$ in. to the right of the thread and continue as before, right round the four edges, tying the ends of thread in a firm reef knot. Turn the cushion over and repeat along the other four edges.

Tufting

Tufts, made of leather, are used to prevent the twine cutting the ticking when tying the cushion down at intervals, to keep the stuffing in place. Thread a mattress needle with strong twine, pass it right through a corner mark, bringing it out at a corresponding mark on the other side, pass it back again $\frac{1}{2}$ in. nearer the centre. Place a tuft on the loop on the underside, pull the ends of twine and tie in a reef knot over another tuft. Leave the ends until all tufts have been secured, then adjust the tying evenly, and trim off the ends of twine.

To make up the cover

Piping cords may be inserted along both edges of the cushion, according to the style of the other soft furnishings in the room, or a plain cover, as for the ticking one, may be made. In any case the cushion wears better if reversible, and therefore made separate from the valence. This may be gathered or pleated, set into a band the exact length of the seat, and secured with drawing pins to the seat, just underneath the cushion. It is thus easily detached for washing and hangs well.

Wall cushions

A window seat is much more cosy if wall cushions to fit are made by exactly the same method. The ends and side pieces are shaped so that the cushions are about 4 in. wide at the bottom

and 2 in. wide at the top. These will stand securely on the seat cushions or may be arranged to fit behind if preferred.

Upholstered cushions for chairs

These may be made direct of thick, dark upholstery material, without the ticking case if using flock, and tufted by sewing matching buttons.

SOFT CUSHIONS

Foundation materials required

For the pad, use unbleached calico for kapok filling which is a soft vegetable down, but downproof ticking for eider-down or feathers, to prevent them penetrating through the cover. For the best result make the shapes and sizes required for the pads, and have them filled by machinery which "blows" the kapok in, making cushions softer. If using existing feathers, for example from an old eider-down, work on a "lino" floor, free from draught and interruptions, until the filling is completed, sewing up the hole *very* closely. Allow $\frac{3}{4}$ -1 lb. of kapok for an average-sized cushion of 18 in. square. Ready made pads may be bought from soft furnishing stores, but these are usually only of ordinary shapes and sizes, whereas you can make your own to suit the special needs of any room in the house.

Choosing the shape

Cushions may be large, medium, or small, round, oval, sun ray, bolster or fan shaped, triangular, square, rectangular, box shaped at the sides, or flat.

The illustrations will give you ideas in choice of shapes and materials.

Make a paper pattern of the shape required, fold down the centre and correct to make both sides accurate, allowing $\frac{1}{2}$ in. turnings.

Making the pad

If using kapok, pin a paper pattern of the shape chosen on double unbleached calico, allow $\frac{1}{2}$ -in. turnings all round, cut it out and machine up, leaving a hole for filling. If making a

plain sides shape, one edge can be placed to a fold, thus avoiding a join. In place of new calico, clean, faded, casement curtains may be cut up for the pads of cushions, provided the cover is not so thin that the colours will show through.

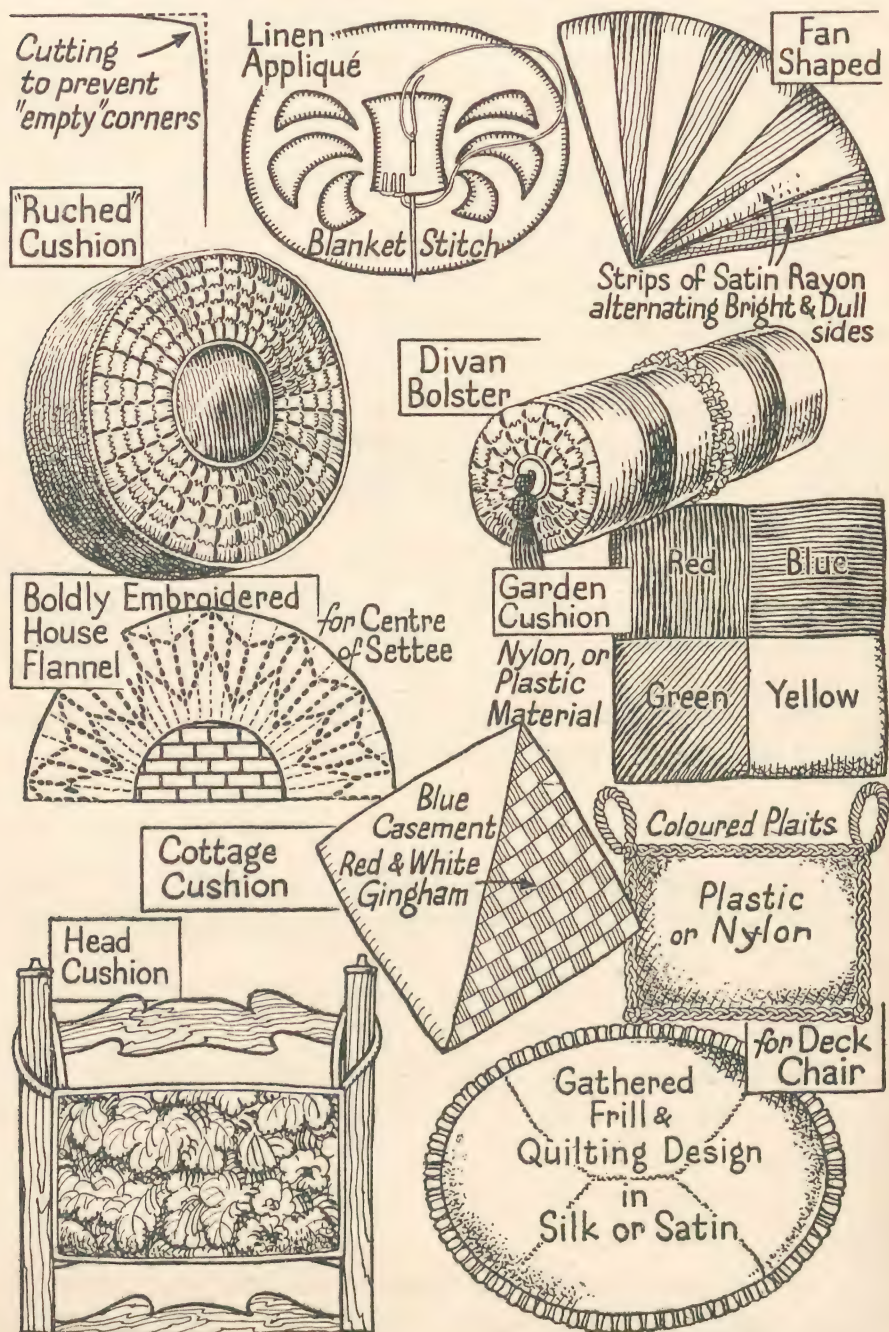


FIG. 7

Always avoid pinning downproof ticking as the feathers work through the holes, but hold in position with weights for cutting out, allowing a wide enough turning to tack outside the line of machining. Turn the pad cover right side out, have it filled and sewn up.

When cutting, to prevent "empty" corners, slope the scissors a fraction of an inch inwards for 3 in. along the sides, instead of straight to the corners.

Covering materials

There is a very wide range of suitable materials such as casement cloth, cretonne, crash, linen, holland, house flannel, gingham, chintz, repp, satin, silk, rayon, suède, taffeta, velvet, lightweight tweed, cottage weave, plastic, nylon, and organdie.

House flannel, embroidered in thick bright wools, looks well, but shrinks badly if washed. Crash, embroidered in bold designs in Anchor Flox, washes excellently. For practical seaside, river, or garden cushions embroider unbleached calico simply in star sylko, or join four squares of different coloured plastic or nylon material, or decorate the edges with plaits of various coloured plastic "threads." For a cottage, gingham to match the curtains, combined with self-coloured casement, is excellent.

Appliqué is charming on self coloured casements, linen, repp, holland or suède. Satin, soft silks, rayon and taffeta "ruche" well. Velvet is often enough in itself, or combined with silk for contrast. Different shades of suède joined up look very well in a dining room. Cottage weave and cretonne are effective with self-coloured casement or repp to tone. A light-weight upholstery tweed in bright flecks makes a plain square or rectangle, suitable for a dark suite upholstered in velvet, and looks well trimmed with a heavy edging cord and tassels.

Chintz may be most successfully piped at the joins in matching or contrasting shades. Organdie, though easily soiled, makes up quickly and is practical in double material of opposite shades, for example pink and blue, or mauve and green.

Arranging cushions

To give a harmonious "whole" the right materials must be combined in one room.

Keep velvets and silks to themselves, but tweeds, house flannel, and a heavy cottage weave combine happily in the same room. Cotton and linen materials often mix well anywhere, varying self coloured with patterned, especially in a "heap" on a divan.

If cushions are to have very hard wear choose washing materials and a design easily laundered.

Round cushions

In this category "arcs" of circles are included. (See "Pouffe" instructions for making a circle on calico.) Cushions of this type shape best if a 3 in. wide side band is joined between two 12-in. to 18-in. circles, as for the window seat upholstered cushions, and they make up well in soft silk, ruched as follows. Allow once and a half or twice round the cushion for the length of material to be gathered, and divide it and the side band into four. Run gathering threads evenly across the quarters from top to bottom, on the wrong side, at $\frac{3}{4}$ -in. intervals, set into a small circle in the centre, and join to the side band evenly. A narrow piping cord may be inserted between the joins if suitable.

Ruched ends to a bolster cushion are most effective, and wide ribbon, gimp, braid, and tassels, make dainty trimmings. Narrow frills inserted between joins give a pretty finish in soft material, and are suitable for almost any shaped cushion.

Oddments of silk, or the good parts of disused afternoon and evening frocks, often make excellent cushions.

Head cushions and pads

For garden, deck chair, or any straight-backed chairs, make a small rectangular cushion, cover with washable material, and attach loops at the two top corners to hang on the back of the chair.

Pads

Pads are cushions filled with flat, soft layers of material such as cheap turkish towelling, under-lay felt, or good parts of old blankets, etc. Cut the "padding" material to the exact size required, stitching several layers together to keep from slipping. Enclose in a closely fitting calico case, and use on the seats of cane or hard wooden chairs, to cover shabby dining chairs, or for

head cushions as above. As they always have hard wear they should have simple washable covers, made up with "mock" piping for instance, accomplished by joining up all sides with $\frac{1}{4}$ in. french seams on the right side. This gives a suitable finish quickly made and makes a firm edge for tying on to the chair with cord.

Appliqué

Any good embroidery book will give details of this perpetually popular decoration, but a bold design with good outline and fitting into the shape of the cushion is essential. Combine similar types of materials, of a firm nature, which do not fray, such as linen. Tack the "pieces" on flat and secure round the edges in blanket stitch with suitable thread. It is very effective to use several bright colours on a neutral background, when black thread will give good style and finish.

Quilting

This also is a mode of decoration which is simple and never dates. Details of the methods will be found in any authoritative needlework book. It is only suitable for delicate, opaque materials such as heavy silk or satin, and the same general instructions given in "Loose Covers" for piping, joining, seams, and inside neatening, etc., may be followed.

POUFFES

Pouffes are as varied in their designs as are cushions. For hard wear choose a strong, darkish washing material. Removable covers are practical and easily made, and two contrasting materials are very cheerful and attractive. In every case select colours and materials to blend with the rest of the room, or even to match if desirable.

For a formal lounge with heavy velvet curtains and deep pelmet, etc., a handsome pouffe to match in velvet and heavy satin is both elegant and practical.

Materials required

All the materials used for loose covers are suitable for pouffes, with velvet and upholstery satin or brocade in addition. Allow

about $\frac{3}{4}$ yd. of double-width material for covering the pouffe, and the same in unbleached calico for the pad, and if needed, $2\frac{1}{2}$ yd. of upholstery cord to tone. As a general rule strong, thick string is needed for tying the "waists," though sometimes a pouffe is made without tying round the centre.

Stuffings

There are a number to choose from such as sawdust, flock, straw, hay, rags, and Algerian fibre.

About two pounds of flock to make a top layer, with sawdust, etc., underneath is a good compromise, but Algerian fibre remains "springy" indefinitely and is light in weight and cheap. As a rough estimate about 8 lb. of stuffing will fill an average-sized pouffe.

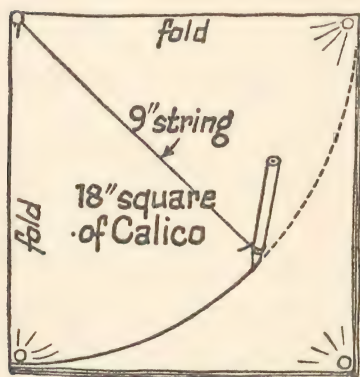
Making a pattern

For an average-sized pouffe two circles of 16 in. to 18 in. diameter are needed, with a "waist" band of roughly 10 in. depth, and long enough to stitch round the edges of the circles, joining them together. To cut out a large circle, tie string 9 in. long to a pencil, fold the calico in four, and fasten it down with drawing pins to the floor boards, or a deal-topped table. Fix the end of the string with a drawing pin to the folded corner, and keeping the string taut, describe an arc of a circle with the pencil on the calico. Cut out along the pencil line, and use this circle as a pattern for the second one. From the pieces left over cut out the "waist" band.

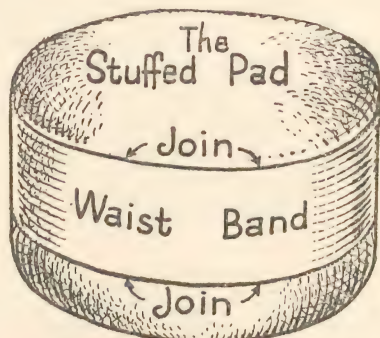
Making a pad

Tack the band to one circle, joining up the band to fit exactly at right angles, machine with $\frac{1}{2}$ -in. turnings, and proceed to join the second circle in the same way, leaving a gap for filling. Stuff well, with Algerian fibre or any other filling chosen, and sew up the hole closely with twine. Now tie *exactly* round the centre using stout string with a second person to pull it tight, wind the string round again, and tie very firmly in a reef knot. Pat the pouffe well into shape, flattening it slightly at the top and bottom,

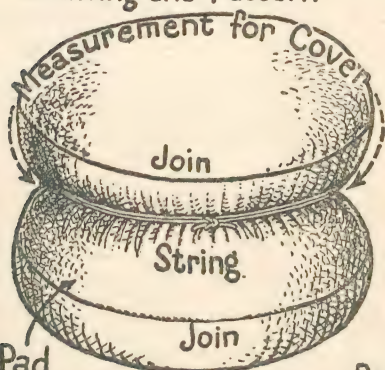
but keeping the sides evenly curved. This method of joining up the pad makes a much stronger and better shaped case than joining two circles, where the "waist" cord ties up *on* the join and weakens it in time.



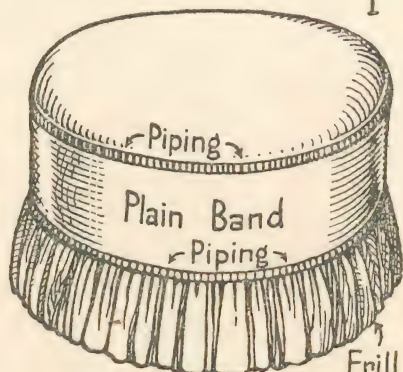
Drawing the Pattern



I



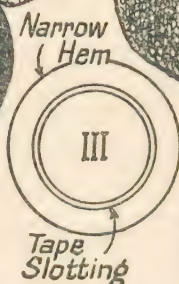
Pad tied
II



Frill
III



Patterned
Material
for Top
Halves



III



Self-coloured
Material

Two squares joined. Ears
formed by tying in excess
material at corners

Cover made with two
circular pieces tied on
to form Frills at Waist

FIG. 8

The cover

Three different methods are suggested in the diagrams :

1. This one can cover a pouffe with or without a "waist," and only slips over the pad, making washing simple. When making, follow the same plan as for chair covers, using a self-coloured repp or heavy casement if suitable for the room. The piping can be contrasting, to match, or omitted if preferred.
2. This type is best made in dark upholstery material, as it must be sewn on. Join three sides of two squares, slip them over the pad, join the fourth side, arrange the cover evenly, and twist the four corners to form "ears," tying them firmly with twine to keep in position. Arrange upholstery cord round the waist, using a curved needle sew it neatly in position, securing the ears firmly with the cord. This style looks well with one black square of velvet or velour cloth joined to another of brightly coloured figured, upholstery material with a black background, and tied with a handsome black silk cord.
3. Here, two circles are cut big enough to cover the top and bottom of the pouffe, with a two-inch frill. Make narrow hems to keep the frill dainty. Now machine the edges of wide tape on each circle to come at the "waist" for a slotting, to hold narrow tape threaded through it, then tie each circle on the pad tightly, arranging the frills evenly, and tucking in the tying tapes well out of sight.

An informal material such as a gaily figured cretonne is excellent for this style, or one self-coloured cover carrying out the chief tone of a figured one to blend, according to the style of the room.

PELMETS

Broadly visualized there are three main types of covering used :

1. Washable, such as American cloth, or one of the new plastic materials, for use in the bathroom, nursery, kitchen, or seaside bungalow.

2. Plain or figured upholstery or curtain material such as cretonne, casement, linen, etc., for use in the dining-room, lounge or bedroom.

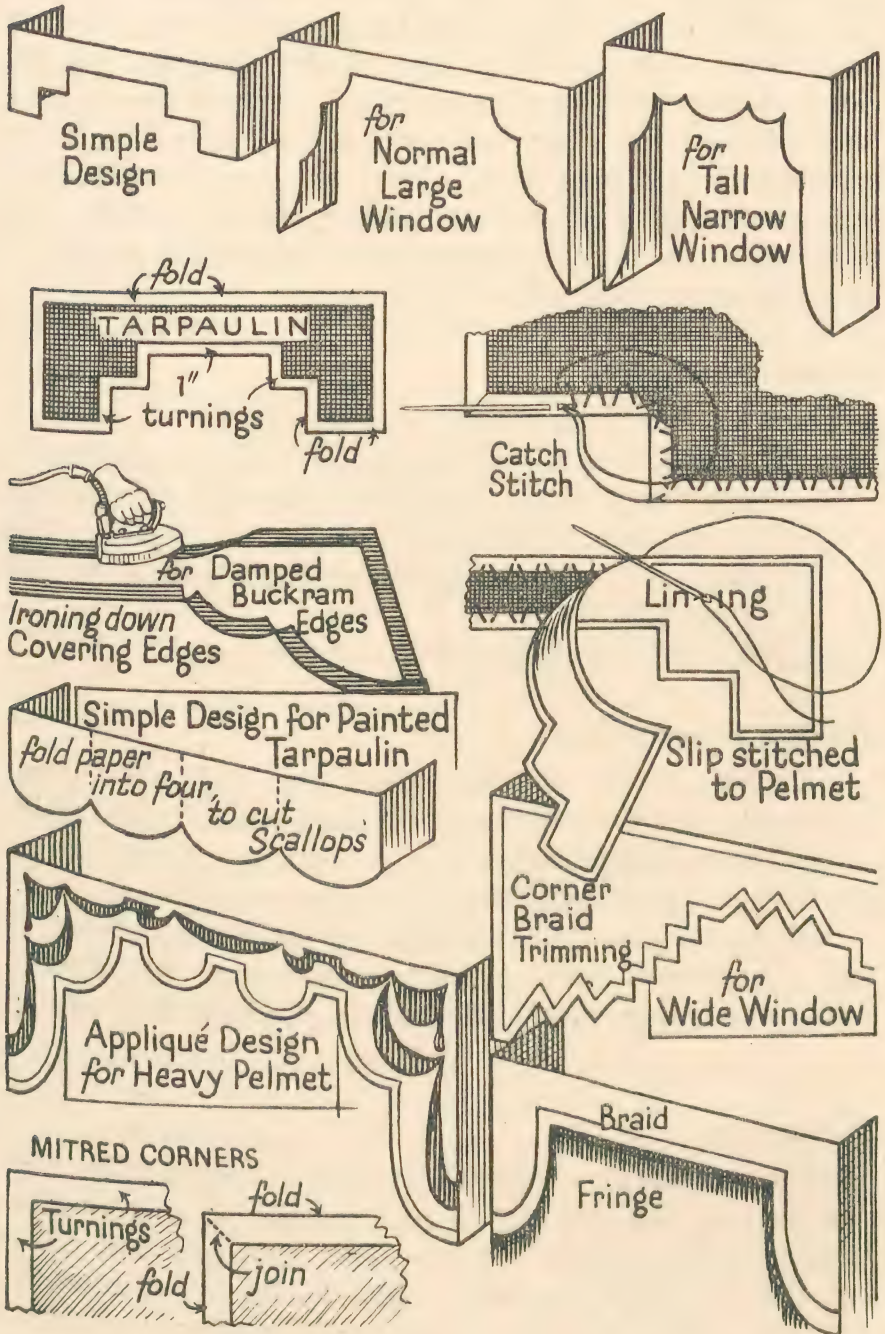


FIG. 9

3. Velvet, heavy satin, or chenille for large windows with imposing draperies.

Often a pelmet is made in self-coloured material to match the background of figured curtains, giving contrast and good style. If, however, the furniture has a figured pattern, nothing looks better than handsome plain window draperies carrying out the background tone of the furniture. In every case the lines should be simple and bold, and the depth one ninth of the whole curtain for correct proportions. For a very long narrow window a happy shortening effect is produced by taking the design well down the sides, but keeping the centre of pelmets narrow to allow for plenty of light.

Materials required

There are three parts to most types of pelmets:

1. The top or surface covering, varied as suggested above.
2. The stiff interlining, using tarpaulin for ordinary materials but sailcloth, for silk, satin, or plastic materials, as the rough stiff edges of tarpaulin would split these soft "fabrics."
3. The lining of casement, sateen, silk or rayon.

Making the pattern

Mark the centre of the pelmet board, use a wide roll of paper to measure from the wall, round the width of the pelmet board and half-way along to the centre. Fold the paper at the centre, place flat on a table, and design the shape of the pelmet.

Before cutting out in material try up against the window to see if the curves are good or the design pleasing. The illustrations give guidance. Only half the pattern is needed for cutting out.

Cutting out

Pelmets usually vary in depth from about 10 in. to 18 in., only requiring half the width of 36-in. material. It is economical therefore to buy half the length required, then split both lining and surface material down the width, join the two strips at the centre front with a flat seam, to make the full length of the pelmet.

Fold the tarpaulin in half down the width, place the straight

edge of the pattern to the selvedge, leaving 1-in. turnings for the centre join only. Fasten, in the correct position, to a deal table with drawing pins, cut out without turnings all round, then join up the centre with a flat seam. Now place this stiff interlining on the wrong side of the covering material, leave 1-in. turnings all round and cut out.

Making up

Tack the interlining to the wrong side of the surface material absolutely flat, turn the edge over on to the interlining, notching at the curves and angles to ensure a flat finish, and making mitred corners, then sew down with catch stitch, as shown in the illustration.

Place the lining with the wrong side to the interlining, allow 1-in. turnings and cut out. Turn in the edge, notching where necessary, and slip stitch just under the edge of the pelmet. If a fringe or braid is used, sew it on before attaching the lining, to keep the window side of the pelmet neat. If a rail is used for hanging sew on rufflette tape 1 in from the top, but it hangs much flatter if fastened direct on to the pelmet board, when upholstery nails may be used, or drawing pins if laundering is likely to be required.

Simple devices

- (a) Coloured 18 in. wide shelving American cloth can be cut to a pattern and secured by drawing pins to a pelmet board without any making up.
- (b) After cutting out a shaped pelmet in tarpaulin, cover with two coats of enamel and hang like the American cloth.
- (c) If upholstery buckram, from furnishing stores, is used for interlining, the following quick method saves considerable time and trouble. Place the cut out buckram on the wrong side of the covering material, leaving 1½-in. turnings, and secure it down with weights. Using a wet sponge damp the edges of the buckram to a depth of 1½ in., then immediately iron down the surface turnings to the damp edges. The damp heat releases glue from the buckram, the turnings stick

down and require no tacking. The only disadvantage of this quick method is that buckram is inclined to lose stiffness in very damp weather.

Repairs to pelmets

Keep a vigilant eye on any rufflette tape used, as it wears with rust from the hooks in damp weather, and renew any worn parts when required.

Reline the whole pelmet if necessary, using good parts of faded, but turned, disused curtains. If the edges are wearing shabby bind with fresh braid, or neaten with fringe if suitable. When the top of the pelmet wears thin or even into holes, cut away the worn edge, turn in the edges again and machine or slip stitch together. If moths have damaged a thick pelmet, treat the holes with any good moth preparation, then cover them with appliqué in a suitable design and material to harmonize.

SECTION VI

THE GARDEN

CHAPTER XXXVII

GARDEN PLANNING

The layout of a garden, whether large or small, should be carefully planned on paper. It is true that some people have a flair for getting the right effects on the ground, but they might save some mistakes and get even better general effects if they first worked out their ideas on paper. After all it is easier to draw a plan and scrap it than to make a garden and scrap it.

The great advantage of planning is that you can, with very little trouble, work out any number of ideas on paper and choose the one you like best. And if your plan is drawn to scale you can work out areas of plots, borders and paths, and quantities of turf, plants, seeds, paving slabs, gravel, etc.

Of course, you must visualize when you are planning. It is the finished garden that matters—the plan is merely a means to an end. But of this more later. We must first look at the ground and measure it up.

The survey

This falls into two parts. There is the practical part, which consists of measuring the garden in such a way that you can set down the outline to scale on paper. And there is the survey of possibilities : of the environment, the views, the aspect and the general nature of the problem.

For measuring up you need a tape measure at least 50 ft. long and a 10-ft. measuring rod, with two or three lines. If you have not got a tape measure you can manage quite well with a stout line knotted at five foot intervals, each knot having a linen tally attached with the distance marked in marking ink.

Before you start make a rough sketch of the garden outline

so that you can figure the dimensions on this as you take them from the ground. Measure straight runs from corner to corner, or to bends. If there are any irregular boundaries stretch a line from one corner to the next and take offset measurements at right angles as shown in Fig. 1. Noting the distance along the line at which each offset is taken will enable you to plot the boundary on paper.

If the plot is rectangular, each angle being a right angle, measuring up is a simple matter. But go over it twice. It is

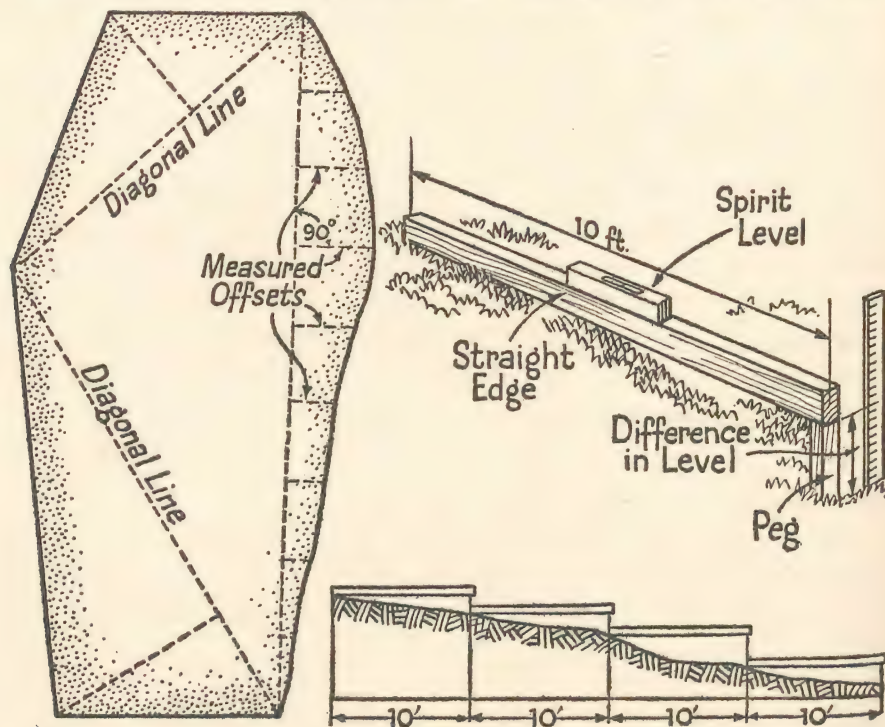


FIG. 1

Left: Site plan showing how an irregular boundary can be surveyed by triangulation and offsets.
Right: How to obtain ground levels and slopes

surprisingly easy to mistake the reading of a dimension. It is also surprising how obstructions will bend the tape and even the wind may blow it into a curve and so give a false dimension.

If the plot is of an irregular shape, with angles greater or less than a right angle, you must stretch lines diagonally as shown in Fig. 1 and measure them. These "ties" if plotted on paper will enable you to obtain the correct angles.

Draw your plan to a fairly large scale. A scale of one-eighth of an inch to one foot is convenient for a small garden, and one-

tenth of an inch to one foot for a large garden. Mark the north point on it. You can find this approximately by taking the sun as due south at midday, G.M.T. If there are trees on the site measure their positions and mark them on the plan. And make notes on it about the nature of the soil and any steep slopes, hollows or other features.

The levels of a garden are important. You can obtain them by using a spirit level on a straight-edge, as shown in Fig. 1. Stretch a line from one end of the garden to the other and drive in pegs at suitable intervals—say, 10 ft. Now level the tops of the pegs with the straight-edge and spirit-level and then take the vertical measurements of the pegs so that you can plot the ups and downs on paper.

If there are considerable differences in level this method can only be used for short distances. But you can do the job in pieces.

When you have drawn the plan to scale draw the sections to the same scale. You may need two or perhaps four or five sections. Mark on the plan the lines along which they are taken and letter them, A, B, C, and so on.

Planning

Now you can start planning. But make a few tracings of your original survey plan so that you do not mark the original. Then you can easily make as many plans as you like.

The plan, as I have already said, is a means to an end, and you must visualize the effect on the ground. You must also visualize the amount of work involved in any features you draw on paper. If you want a level lawn on a steeply sloping site then obviously a lot of excavation and filling will be necessary. If you want a lot of flower beds arranged in a pattern in the lawn then let a lot of work will have to be done in trimming the grass edges. Unless you have plenty of spare time and are really enthusiastic it is wise to plan the layout for simplicity both in construction and maintenance.

So you must resist the temptation to draw elaborate features on paper which may be too much for you on the ground.

Now you must decide what area to allow for the vegetable garden and where to have it. Most people prefer it at the

bottom of the garden or in an inconspicuous position, though it is possible to plan an attractive vegetable garden which need not be placed out of sight.

For the average narrow plot the front garden is quite separate from the back and is also quite small, so it can be considered as a small garden by itself. But before getting down to detail we must consider broad principles.

Garden layouts are mainly of two types : formal and informal. The formal layout is more or less symmetrical with straight lines predominating, regular features and shapes and a balance between its parts. The informal garden is planned in a more free manner with irregular curves and shapes. But with both you should aim at a restful effect. It is a big mistake to cut a garden up into small pieces. The eye is confused and finds no broad area or focal point. So make the largest part of the design a lawn, a group of flower beds, a clump of trees, or some other feature which dominates the whole garden.

The choice between the formal and informal layout is largely a matter of personal taste. You can even combine the two, but do this in a harmonious way. Do not divide a small garden into entirely separate pieces of formal and informal layouts.

The site and its environment should help you to decide. A rectangular site on level ground with no trees makes a formal layout easy. An irregular site with ups and downs lends itself better to an informal layout, especially if there are established trees.

Whatever the type of layout the garden should be planned so that it can be seen to the best advantage from the principal rooms of the house. With most houses the French windows of the living room or lounge is the chief view-point. A line drawn on the plan through the centre of the window will give an axis line which should lead the eye to a focal point.

The solar aspect is important as the chief flower borders and beds must have plenty of sunlight. A south aspect receives maximum sunlight, provided that it is not shaded by large trees, boarded fences or the house itself. Of course, there are many plants which do better with partial shade, and an east or west aspect will suit them better than a south. There are also plants which flower and thrive with very little sun and a north aspect will suit them.

Now let us consider the formal and informal layouts in detail.

The formal garden

The characteristics of the formal garden, as already mentioned, are symmetry, balance, rectangular shapes (though circles and geometrical patterns can also be adopted), straight paths and formal features.

Formal gardens can be of any size, but they are better on small plots than are informal layouts. For the small plot they

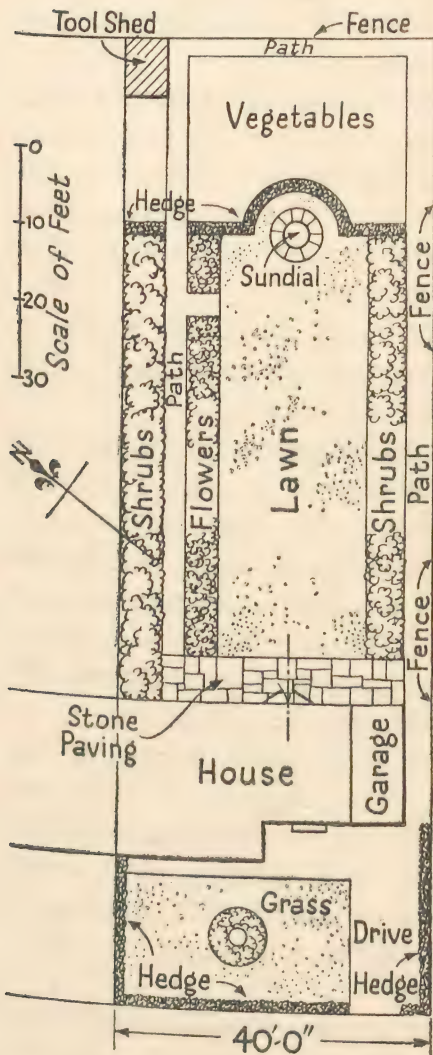


FIG. 2. Simple layout for a semi-detached house with a fairly wide garden

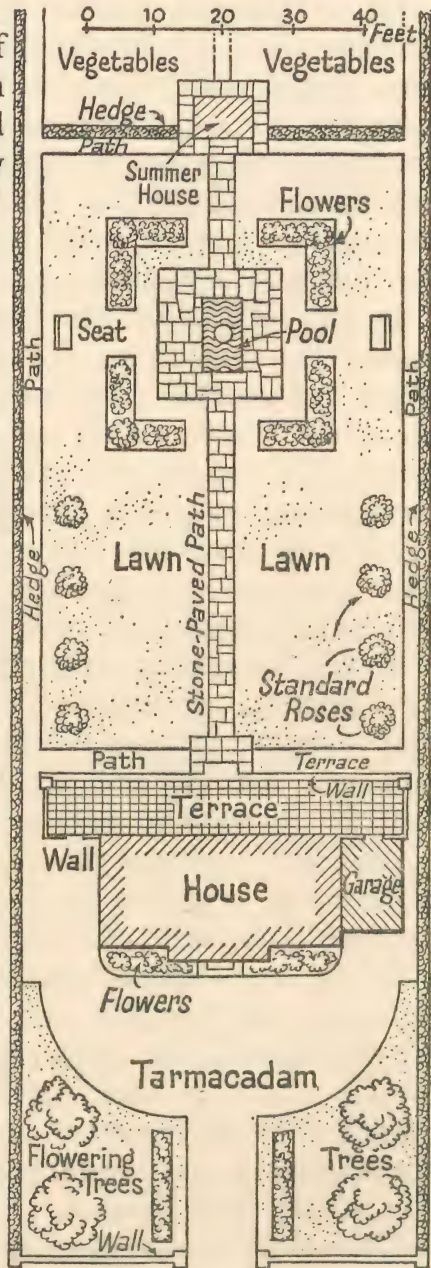


FIG. 3. FORMAL GARDEN, 60-FT. FRONT-AGE, WITH TERRACE AT THE BACK. The large curved drive at front would enable a car to be turned round

should be simple. A plain rectangular lawn with flower or shrub borders and paths on each side will look much more restful and pleasing than one cut up into elaborate patterns.

Fig. 2 illustrates a formal garden for a suburban site of moderate width—40 ft., though it can be adapted to a narrower site. Notice that the lawns and the French window are on the same axis. This gives a good view of the garden, but it is not always possible as the principal living room may be on the other side with the window only a few feet from the party fence. In that case the window would look straight down the path, and this, too, is quite a pleasing arrangement.

In Fig. 2 the end of the lawn has a sundial to form a focal point. You could have a bird bath, a formal pool or just a round flower bed instead. The lawn is backed by a hedge but this should not be high or it will take too much sun from the vegetable garden. A box hedge is the thing for such a position—it is compact and neat and not rampant growing.

A formal layout for a larger garden is illustrated in Fig. 3. Here it is possible to have one or two rather elaborate features which are yet integral parts of the main scheme.

Formal flower beds can be arranged in geometrical patterns in both grass and stone paving, as in Figs. 4 and 5. They look very attractive in grass provided that the edges are regularly trimmed. But they are pleasing enough in stone paving and here the edges are no trouble. If you have little spare time for maintaining the garden you will be wise to reduce grass edges to a minimum. One way of doing this is to edge the lawn and beds with stone slabs, the slabs and grass being flush.

In the larger formal gardens it is possible to make a fine feature of the principal path or drive, flanking it with wide flower borders. The herbaceous border is a favourite, but if you want a border as labour-saving as it is pleasing plant dwarf munstead lavender at the front and polyantha roses at the back. Catmint may be used instead of lavender, if you care to sacrifice the pleasant lavender scent.

The chief path should terminate in some feature which forms a strong focal point. It should not merely trail out. A wide path or drive may lead to a summer house, a pool or a statue. Or it may guide the eye to a pleasant view of country beyond.

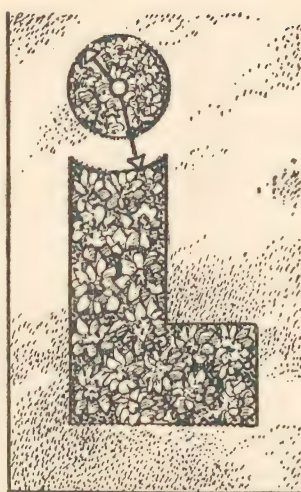
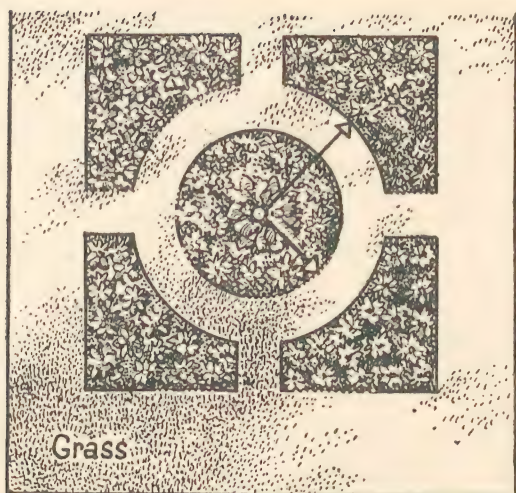


FIG. 4

Left: Formal flower beds in lawn

Right: Corner beds in lawn

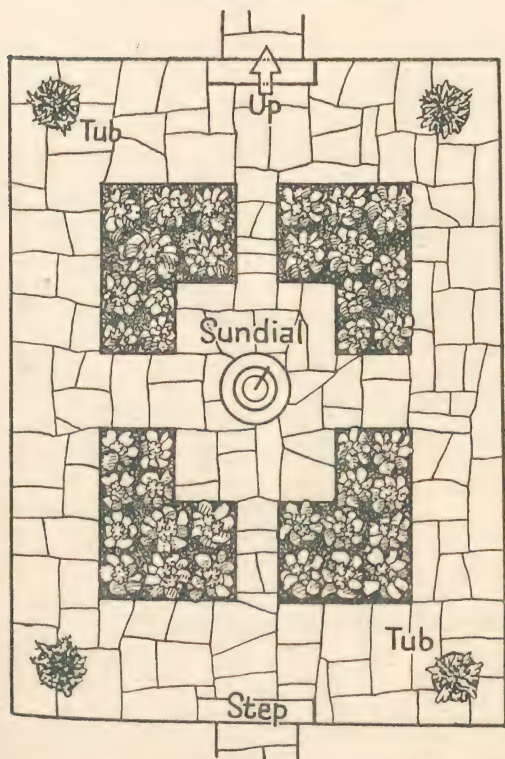


FIG. 5

Left: Formal beds in paving

Right: Corner beds in paving

In that case perhaps an arch covered with roses or a climber of some other plant will frame the view.

The formal garden should be level or nearly so. If the site has a steep slope it should be arranged in level terraces, and this

should be done as shown in Fig. 6, the high part being excavated and the soil used as filling for the low part. The filling must be tamped down or rolled to consolidate it. The surface soil from high ground should be put on one side and spread on the surface when the excavation is complete as the subsoil will not be much use for growing plants or grass.

The informal garden

With this type we are not bound by rigid axis lines and principles of symmetry. The informal layout is free and takes

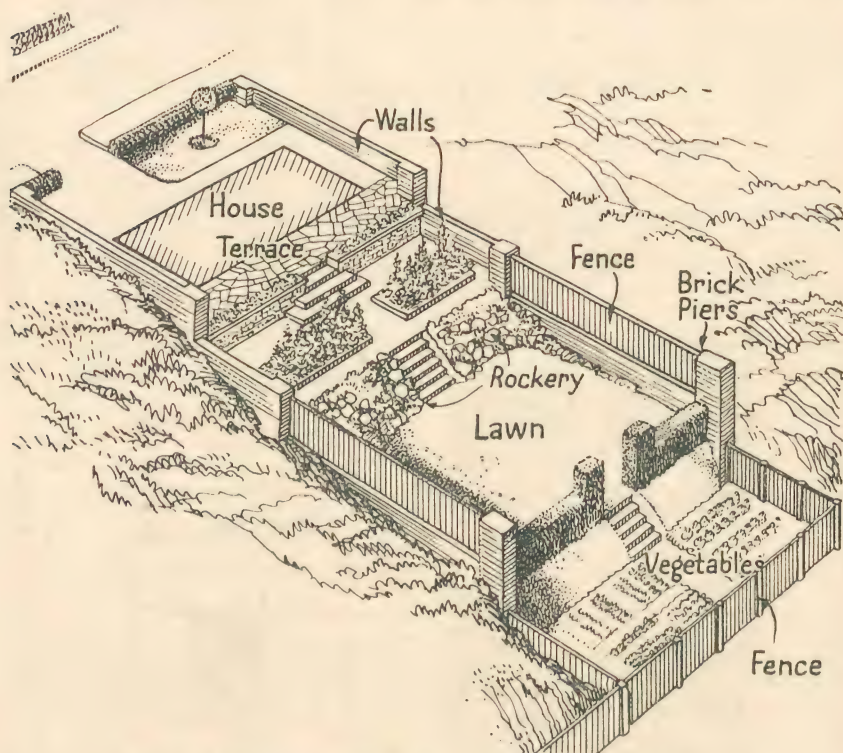


FIG. 6. A STEEPLY SLOPING SITE LEVELLED IN TERRACES

advantage of the natural features of the site. The degree of informality varies from the slightly informal to the "wild" or "natural" garden. Generally, the more "natural" the garden the bigger it must be. A small rectangular suburban plot is obviously not suitable for a "wild" garden.

Fig. 7 illustrates a moderately informal layout for a suburban garden with a width of about 40 ft. It is simple but interesting, with shrubs and trees planted at the back and against the side

fences, and herbaceous plants at the front, thus providing shelter from winds and through the spring and summer a sweep of colour all round the lawn. The trees and shrubs should not

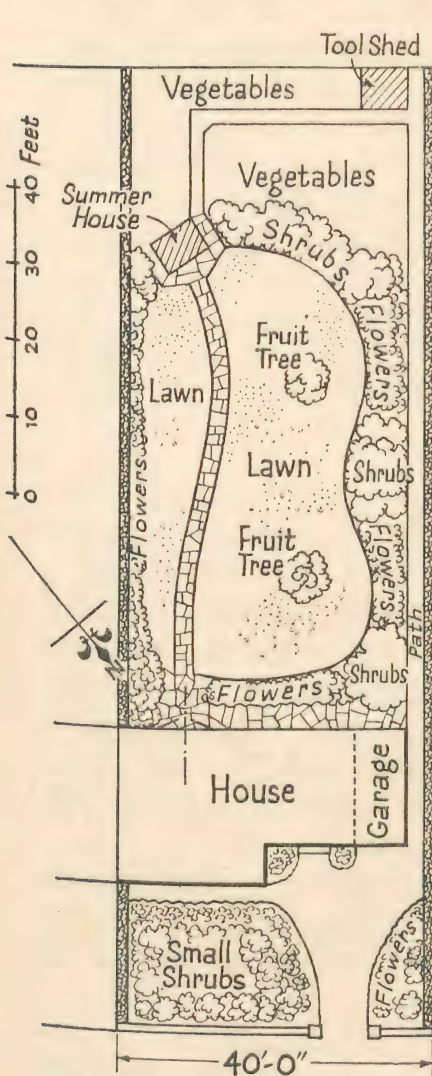


FIG. 7. INFORMAL GARDEN ON A RECTANGULAR PLOT

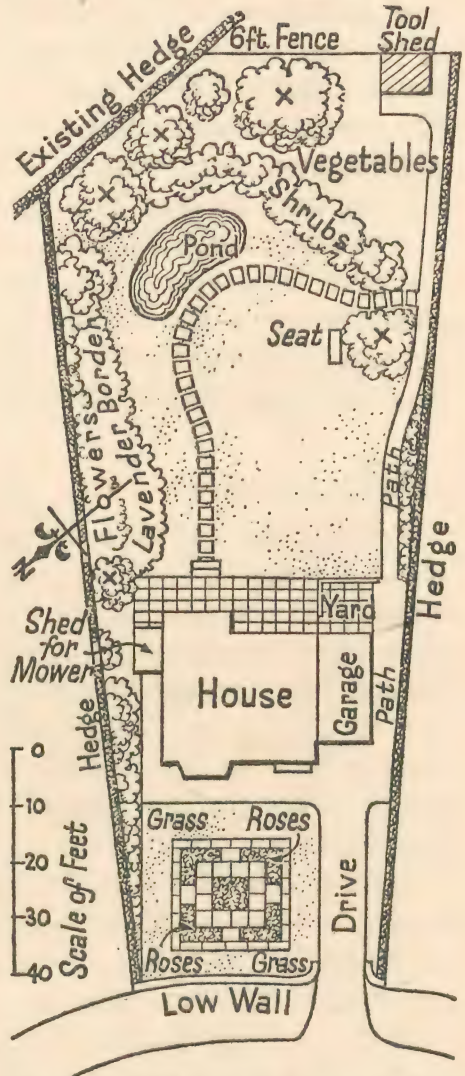


FIG. 8. INFORMAL LAYOUT WITH TREES AND SHRUBS SCREENING AN UNINTERESTING VIEW AT THE BACK. THE FRONT GARDEN HAS SMALL FORMAL LAYOUT

be large or rampant ones or they will make the garden dark and dreary.

A fairly large informal layout is illustrated in Fig. 8. This site is wider at the back than at the front, a very convenient shape from the garden standpoint. Here too the layout is simple, with a few trees at the back to screen an uninteresting view and

a wide sweep of shrubs and flowers. The "kidney" shaped pool fits naturally into the inside of the curved border and the path curving along the lawn leads from the house along the pool and then to the vegetable garden. This path consists of pre-cast concrete slabs set in the grass—a square slab and then a square of grass, and so on. The front garden consists of a formal square pattern of rose beds set in stone paving with a wide grass outer border. Where the front garden is quite separate from the back a change of type is justified.

If you have a large garden it is a good idea to divide it in two—one part being formal and the other informal. But one part should be larger than the other and should lead into the smaller. A hedge, a bank of shrubs or flowering trees, or a pergola can be used as a screen and a link between the two.

Special gardens

You may wish to make the whole of your garden or a part of it one of a special kind. A rose garden, an Elizabethan garden, a rock garden and so on. If you have plenty of ground you can make several special gardens, separated by hedges or shrubs and leading into one another. A suitable layout is illustrated in Fig. 9. If you have hedges or other screens it is important to arrange them so that they do not create extensive shady areas, which means that the hedges should run north and south, so leaving the south side of the garden open.

Bush roses look best in ornamental beds set in grass or stone paving and this gives a good opportunity for geometrical patterns as shown in Figs. 4 and 5. In an informal garden they can be arranged in beds bordering the paths.

A rock garden should be made on sloping ground for preference, but, of course, you can build mounds and place the rocks in position. If you use ordinary quarry stone place it with the surfaces sloping slightly backwards so that they appear to jut out of the ground like a natural outcrop of stone. But if you can buy waterworn stone the effect is better and more natural. There is an art in placing stone to the best effect. Aim at reproducing a natural setting. So many rock gardens made by amateurs look like heaps of stone.

A rock garden needs good drainage, but care must be taken to

give the plants the sort of soil they like. Label each pocket with the name of the plant it is intended for and then fill it with a suitable soil, as recommended in the nurseryman's catalogue.

GARDEN CONSTRUCTION

A lay-out plan drawn to scale with sections showing the levels, as already recommended, is of great assistance in the practical work

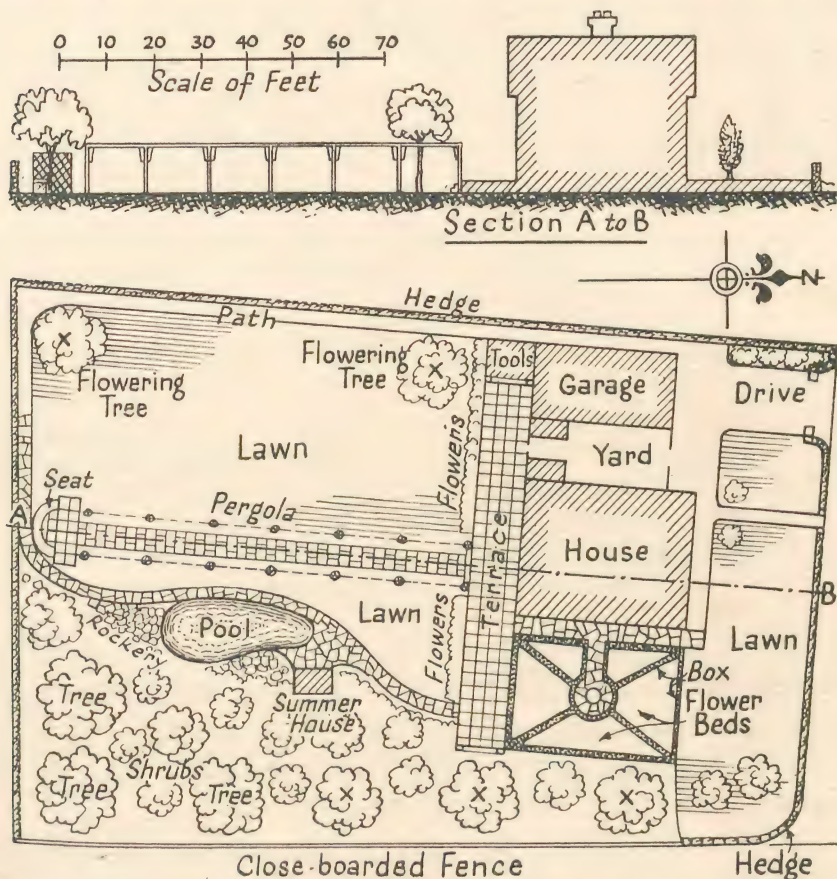


FIG. 9. GARDEN FOR A CORNER SITE

Formal and informal are blended together. Chief features are a long terrace, pergola and screen of trees at exposed side

of constructing the garden. By "garden construction" we mean the setting-out, excavation, filling, levelling, digging, and making drives, paths, steps, terraces and walls. In fact, all the work of making a garden short of planting and sowing seed.

From your plan you can take all dimensions for setting-out. This saves time, and also saves mistakes. You can measure

quantities of materials exactly, and, if convenient, order them well in advance of undertaking the work.

Setting-out

The tape measure, lines and ten-foot rod, already mentioned in connection with the survey of the site, will be needed in setting-out. And also a square, which is merely two pieces of wood joined at right angles as illustrated in Fig. 10. This will be needed in setting-out flower beds, paths, terraces and walls. The 10 ft. rod can be made from a straight piece of wood, about 3 in. by 1 in., planed and marked in feet, cutting the marks with a tenon saw and filling the cuts with red paint. The marks should, of course, be numbered. A straight-edge and spirit-

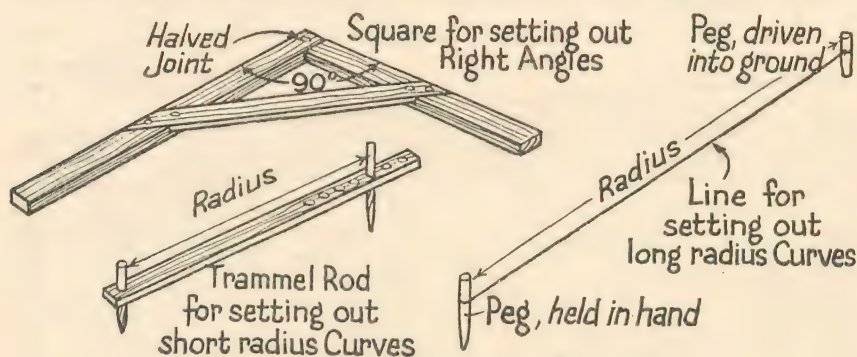


FIG. 10. HOME-MADE TOOLS FOR SETTING OUT

level will be required in the levelling operations. The straight-edge can be a planed board, about 6 in. by 1 in. taking care to make the edges straight and parallel. Buy a good spirit-level, 12 to 18 in. long. You will also need a few dozen pegs, about 2 in. square and 2 ft. long with one end pointed.

If the boundaries of your garden are straight the work of setting-out will be simplified as you can set out distances from the boundaries. But if they are irregular or curved it is better to take the sides of the house as starting points. For example, if you have a path leading down the garden at right angles to the back of the house, start by fixing a line down the centre of the path and use the square to set the line at right angles to the house wall. This axis line can then be used as a guide in setting-out flower beds at the sides of the path, and also the width of the lawn if it is parallel with the path.

As you work check all dimensions and angles. You will make a few mistakes but this does not matter if they are discovered before they accumulate. You will find, by the way, that if you have all lengths and widths figured on your scale plan the work of setting-out will be easier. But you are just as likely to make mistakes on your plan as on the ground, so keep on checking dimensions.

Now for some of the tricky problems in setting-out. Curves, for example. A circle or a segment of a circle can be set out by using a trammel for a short radius or a line for a long one. A trammel can be made out of a length of wood about $1\frac{1}{2}$ in. by $\frac{3}{4}$ in. Bore a hole near each end to receive short pegs pointed at the ends. The trammel is used as a compass, as shown in Fig. 10. The distance between the pegs is the radius of the circle to be set out. If you bore a series of holes you can adjust your pegs to any required radius within the length of the trammel.

To set out curves of long radius it is easier to use a line. Tie one end of the line round a pointed peg—this will be used for marking the curve on the ground. Drive a peg into the centre of the circle and make a loop in the line to cast loosely over the centre peg as Fig. 10. The length of line used must be the radius, of course. By holding the line taut and revolving it you can mark the curve on the ground.

Curved paths and borders which are not required to be true arcs of circles can be set out "freehand." Just take a sharp pointed stick and scratch the curve on the ground. Now stand away and see if it looks right—that is if the curve is regular with no uneven ins and outs. Correct any imperfections.

By the way, when you have drawn your plan you may still be uncertain about the appearance of the lay-out. If you set out the lines on the ground and then mark them with garden lime you can stand back and get a better idea of the layout, particularly if you view it from an upstairs window. But walk round the garden and view it from all angles. It may well be that you will then see how it can be improved.

In setting out geometrical patterns, such as the rose beds illustrated in Fig. 5, make a drawing to a large scale and figure all the dimensions on it. Mark the centre on the ground by driving a peg. Then set out the outline, using the square to

get the angle true and the trammel for circles. The smaller dimensions can be set out with a two-foot rule.

When measuring with the tape or rod take care to hold them level, and mind that obstructions do not bend the tape.

If you have a very long line to set out use ranging poles. Laths about 5 ft. long will serve. Set up a pole at each end of the line. Then get an assistant to hold a pole upright roughly half-way along the line. By standing behind one of the end poles and sighting the pole at the opposite end you will be able

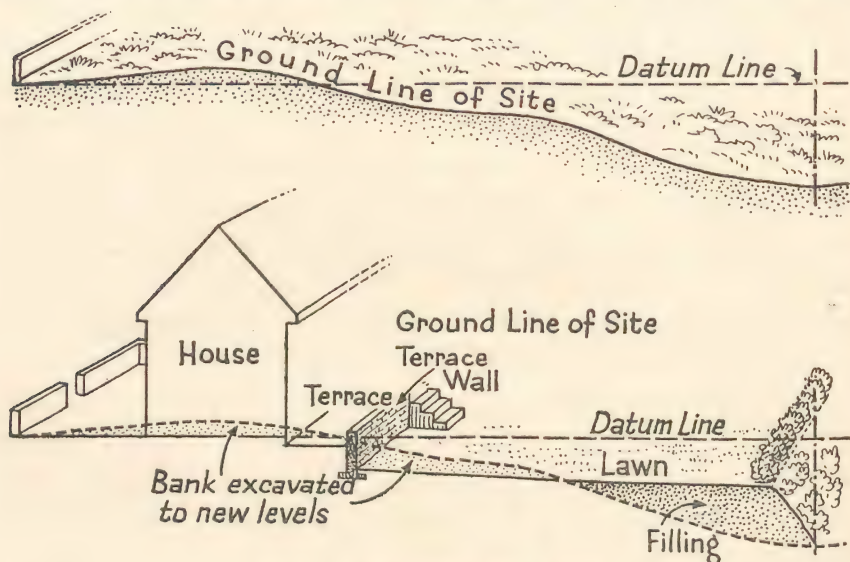


FIG. II. LEVELLING SLOPING SITE

Top: Natural ground line of site

Bottom: Section showing how soil is excavated from high ground and filled into low portion to give a level lawn and raised terrace

to direct the assistant to bring the intermediate pole in line with the end poles. More intermediate poles can be set up in the same way.

Levelling and gradients

With few exceptions the surfaces of the garden should be brought to levels or regular gradients. The ground may, of course, be level or have a regular slope in the natural state, but even then you may wish to alter some of the levels.

Directions have already been given for obtaining differences of level by using the straight-edge and spirit-level. These two tools are used also in setting-out levels. You will need a good

supply of pegs for levelling, say, a plot for a lawn. If the ground is in a rough condition clear it first and roughly level the humps and hollows. Then decide the level to which you wish to bring the whole surface. Place a peg at any convenient point and drive it down until the top reaches the selected level.

On sloping or uneven ground you must be careful in selecting this level. The aim must be to balance the excavated soil with the filling, otherwise extra soil will be needed or a surplus will be left. If you have already taken the levels and drawn sections to scale you will be able to decide a suitable level. If you have not you must guess it.

Your first peg is the datum peg so see that it is firm and not disturbed. Now by using the straight-edge and spirit-level you can transfer your level over all the area, putting in pegs to the correct level at intervals of 10 ft. or so.

The series of pegs then serve as a guide to the excavation and filling. After the filling has been lightly rammed or rolled to consolidate it, you can use the straight-edge over the pegs to smooth the surface off.

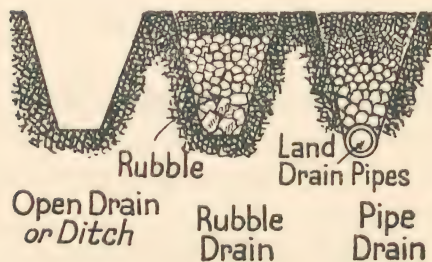
If you want a camber to your lawn set out a centre line and place your high level pegs along this, then at suitable intervals on each side set out lines of pegs about 1 in. lower than the preceding line. This will give you an even gradient on each side of the centre line but you can convert it to a camber when finishing the surface by eye alone.

To set out a gradient that is an even slope, proceed in the same manner, driving in pegs at intervals of, say, 10 ft., each one being lower than the preceding one by the same amount. This amount should be worked out before you start work, and it can be found from the scale section, or, if you have not prepared one, by first finding the difference in level between the top and bottom of the slope. Then divide this difference by the same number of parts as you have spaces between levelling pegs, and this gives you the amount of difference in level between any two consecutive pegs.

For example, a distance of 110 ft. divided into 10-ft. spaces between levelling pegs gives you eleven spaces (remember that there is one more peg than number of spaces, so you have twelve pegs). If the overall difference in level is 2 ft. 9 in. (33 in.), then $33 \div 11 = 3$ in. difference in level between

consecutive pegs. It will make setting-out easier if you make a gradient board, that is, a board 10 ft. long with one edge cut to the slope of 3 in. in 10 ft. Use it like a straight-edge but keep the sloping edge downward and place a spirit-level on the top edge when using it to set the pegs to the correct levels.

Some sloping sites are set out in several terraces. Scale drawings of the sections will be a big help in setting out, as from the drawing you can measure approximately the required depth



of excavation at each "step," and you can also set out the terrace levels so that the excavated soil provides just enough for the filling, as shown in Fig. 11.

Hints on setting out steps, walls and other garden brick-work and masonry will be given later when these features are dealt with.

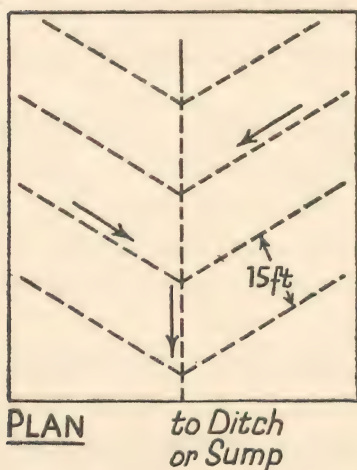


FIG. 12. HOW TO DRAIN WET GROUND

Site drainage

On heavy soil it may be necessary to provide sub-soil drainage. Heavy soil at or near the top of a rise will probably drain itself sufficiently to avoid the retention of too much moisture. But the same soil in a "basin" or at the bottom of a long slope may need sub-soil drains. Clay, of course, is the heaviest kind of soil and without drainage it may become water-logged in wet weather.

The best method of land drainage is to lay lines of land drain-pipes, which are porous earthenware pipes without sockets. They are laid dry and a layer of stones is placed on top, so that water can reach the pipes, and then the trench soil is replaced. But if there are plenty of stones on the site, or brick rubble, you can make your drains by cutting narrow trenches and placing

the biggest stones and pieces at the bottom with the smaller stuff on top, as shown in Fig. 12.

The drain or trench must slope downwards to allow the water to run along it, and there must be a suitable outlet. In the country there will probably be a ditch available, but in the town you must dig a deep hole and fill it with rubble to serve as a soakaway.

The drains should be laid in straight lines about 15 ft. apart. A good plan is to run a central drain with branches at an angle as shown in Fig. 12. Lay the drains so that they carry the water away from the house. The depth should be not less than 2 ft. The fall should be at least 1 in 40 and regular, that is, without dips and rises.

Good drainage is essential for a lawn or tennis court, and if the ground is heavy clay in a depression or at the bottom of a slope it will be necessary to lay a 4-in. bed of clinker or gravel at a depth of 9 in. below the surface.

CHAPTER XXXVIII

MAKING THE GARDEN

PATHS, PAVINGS AND DRIVES

The construction of paths, pavings and drives is of considerable importance because both the appearance of the garden and the amount of maintenance work are involved. Generally, natural stone flags look best, but they are costly. Earth paths are cheapest but they are muddy in wet weather and allow weeds to grow.

What materials are available? Firstly, there are the loose materials: earth, sandy gravel, washed gravel, granite and stone chippings, furnace ashes. Then there are the slabs: stone and pre-cast concrete. Bricks can be used, and they are lighter to handle than slabs. Then there is concrete poured on the site. Finally, tar macadam and bitumen macadam.

The path foundation

A suitable foundation must be prepared for surfacing. This depends largely upon the nature of the ground. On clay you

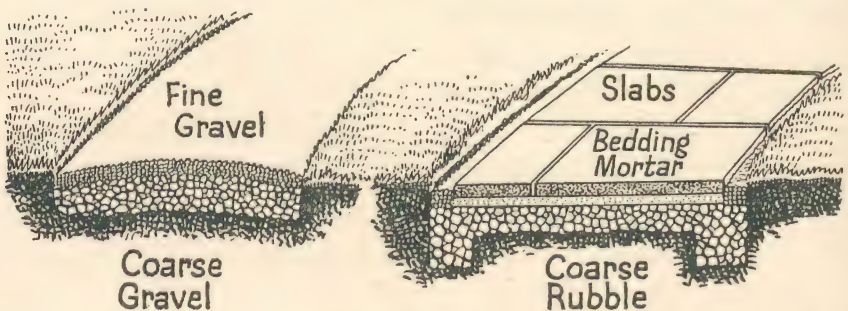


FIG. I

Left: Gravel path

Right: Slab path with strong foundation for a damp site

must have a foundation which will prevent the path from becoming water-logged—at least 4 in. of broken brick or stone ballast spread and rolled. On soft sand or soil the same type of foundation is needed to give adequate strength and support to

the surfacing. Only on a firm, well-drained soil can you lay the surfacing direct, and even then it is advisable to spread about 2 in. thickness of clinker or small ballast.

The top soil should be stripped to a depth of 6 to 9 ins. As this is usually rich vegetable soil it should be useful for spreading on the garden or filling hollows. The bottom of the excavation should be levelled or finished to any required gradient. A width of 3 ft. is sufficient for paths in small gardens, but in larger gardens 4 ft. looks better and enables two people to walk side by side.

The foundation material should be 2- or 3-in. pieces where a thick foundation is required. If the sizes vary much place the bigger pieces at the bottom and the smaller on top. Spread the material to a little more than the required depth and then roll it—the heavier the roller the better.

If the ground is firm and well drained no foundation is required but it may be an advantage to spread and roll an inch or two of gravel or crushed clinker. This will assist surface drainage and prevent the surface material sinking into the soil.

Earth, gravel and chippings

A light loam on a well-drained subsoil makes a fairly good path except in very wet weather. If you can get some sandy gravel and spread it lightly over the earth path and then roll it in, the surface will be strengthened and it will look better.

Small furnace ashes and crushed clinker can be used for surfacing. They allow rainwater to pass straight through, so that the surface soon dries after rain, but as they are very light they “pick up” easily and must be frequently rolled. They are bad in frosty weather as the frost breaks up the surface.

Gravel is better than ashes as it is heavier and so does not easily pick up, and is also much better-looking. A well-rolled gravel path, provided it is kept free from weeds, looks very well, and if crushed granite chippings are used the effect is even better.

Stone slabs

Natural stone slabs, as already stated, have the best looking surface but are costly. But once laid they last and give no

trouble provided the foundation is reasonably firm and well drained.

Stone slabs are obtainable in random rectangular sizes, and also in regular widths with random lengths. Then there are the broken slabs of irregular shapes which are used for crazy paving. Various patterns are illustrated in Fig. 2.

There are various methods of laying stone slabs. One is to spread sand or riddled loam over the foundation, without

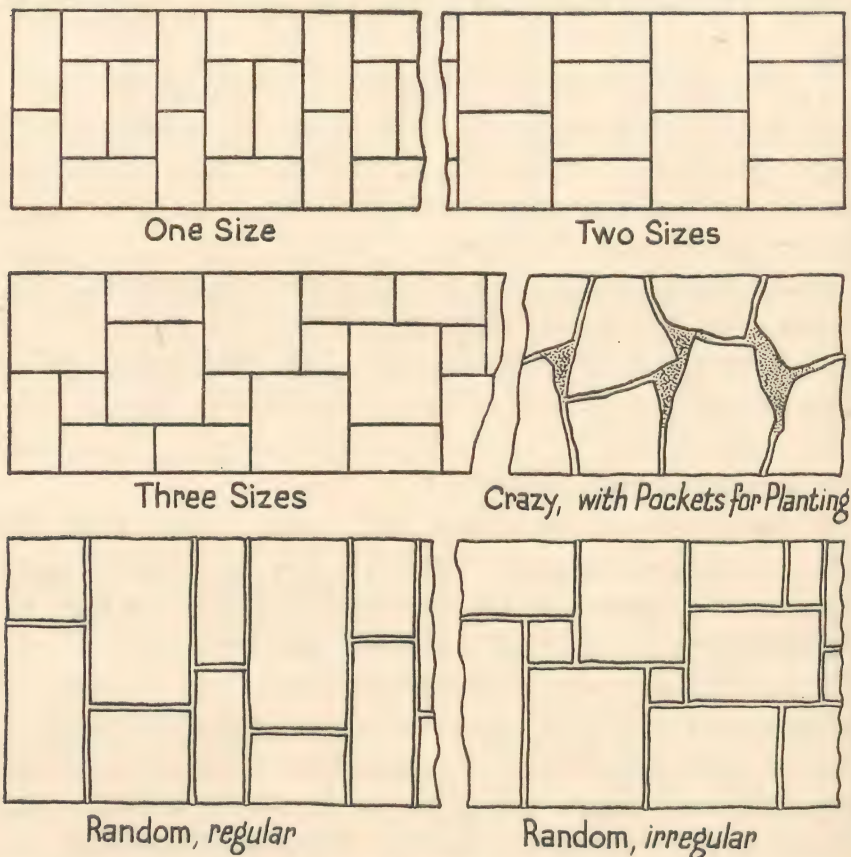


FIG. 2. SLAB PATHS AND PAVING

rolling it. As you lay each slab scoop out the sand or loam from the middle of the slab area so that the slab will be supported along all edges but not in the middle. The reason for this is that the slab will rock if there is centre support, as when walked on the support under the edges will be compressed.

Another method is to bed the edges of the slabs in mortar. Use a mix of 5 parts sand to 1 of Portland cement, mixing in the dry state and then adding water gradually and mixing to form

a mortar, which should be moderately stiff. Place two or three trowelfuls of mortar at each corner, the amount will depend on the size of the slab. Spread it so that it provides support for the meeting corners of at least two slabs. When the mortar for the four corners has been spread it should meet along the edges leaving a hollow space in the middle. Two people should hold the slab level and gently lower it. Then tap it with a heavy piece of wood at each corner in turn until it is level and flush with the adjoining slabs. The slabs should not be trodden upon for three days.

Crazy paving

Irregular slabs of stone or broken concrete slabs can be used for crazy paving. Select larger pieces to fit as closely as possible and fill in the gaps with smaller pieces. The paving can be bedded on sand or fine earth, as already described; or mortar can be used, bedding the corners only of the larger pieces while the smaller pieces should be pressed into the mortar. If you want to grow paving plants, such as Thyme, in the crevices leave wide gaps (about 1 in. between the pieces, or make tight joints and leave out smaller pieces to form pockets).

Planted paths are all right if they are not much used. For the main paths it is better to have the joints pointed in cement mortar. This makes a clean finish and prevents weeds rooting in the joints.

Pre-cast slabs

Paving slabs of pre-cast concrete are excellent for garden paths and terrace paving. It is true that they lack the interesting irregularity and varied tones of natural stone slabs, but they are much cheaper, and when they have weathered look unobtrusive. If you dislike the grey cement colour you can buy slabs faced with buff cement.

Several sizes are kept in stock; and, by the way, pre-cast products are made by numerous firms all over the country, so there is no difficulty in obtaining supplies; but the 2-ft. by 2-ft. size is best for most purposes. For one thing it is not too heavy, whereas the 3-ft. by 2-ft. size takes two people to lift and place it. For narrow paths the 2-ft. width is enough and for wider paths

two slabs can be laid side by side to make a 4-ft. width, while on terraces the 2-ft. square is a convenient size.

If you like you can use two sizes of slabs, as illustrated in Fig. 2, and you can lay them either in continuous joints or bond them by breaking joint.

You can make your own pre-cast slabs, as described below, but they will not be so good as those made by machinery, chiefly because the latter are consolidated by vibration which produces a dense smooth material.

Making concrete slabs

The slabs are cast in wooden formwork. The simplest way to do it is to arrange a frame on a strip of level ground. Planed wood 2 in. by 1 in. is needed, the pieces being arranged in a square or rectangle of the required size. They are held in position by pegs driven into the ground. Just before placing the concrete a layer of damp sand should be spread over the bottom of the formwork and smoothed with a piece of wood cut at each end so that it fits into the form. See Plate VI, A, following p. 312.

A 1 to 3 mix of cement and sand is suitable, and the quantities required per square yard for slabs or paving $1\frac{1}{2}$ in. thick are: 35 lbs. of Portland cement to 1.2 cubic feet of clean sand.

A simple method of measuring and mixing recommended for such work by the Cement and Concrete Association is to take at the start a bucket, a saucepan, a clean wide board, a trowel, some sand, cement and water. Pour water into the bucket until it is a quarter full, then put in three saucepanfuls of sand. Thoroughly stir the water and sand together. Both water and sand should be clean. If they are dirty the concrete will be weak and may flake or dust up.

When the sand has settled after stirring carefully pour off the excess water. The sand in the bucket now contains the right amount of water for making good concrete. Dump it out on the clean board. Now measure a saucepanful of cement and dump it on the wet sand. See that you have a board wide enough to provide ample mixing area.

Next, get your trowel—better still, a spade—and mix the cement and sand together. This should be done thoroughly

until the heap is of a uniform colour throughout. Take a bit of trouble with the job. It is an important part of the process and worth doing well.

Having prepared the framework and smoothed off a layer of damp sand at the bottom, as already described, proceed as follows.

Use the spade to dump the mix from the board into the formwork. Pat it down firmly so that it is well consolidated. Then you can "screed" it by using the opposite edge of the wood you employed to smooth the sand. This will provide an even surface.

It simplifies the production of small slabs if you cast the concrete into formwork about 3 ft. square. Then, while the concrete is still in a plastic state, cut it into the desired shapes. A sharp trowel is excellent for the job. Cut it through the complete depth. You can use the trowel "freehand" for cutting shapes for crazy paving. But for cutting rectangular shapes divide the slab into equal widths and use a straight-edge to guide you in cutting the concrete.

Let the wet concrete stand for about one and a half hours before cutting up. If cut while it is too wet it will "run" and close the gaps. Leave the slabs for four or five days to harden before lifting them, and during this time they should be protected from the sun and wind so that they will not dry quickly. If concrete is dried quickly it tends to craze and weaken. Clean sacking or the paper bags in which the cement is delivered can be used for covering.

Concrete paths and drives

For narrow paths on a firm foundation a thickness of 2 in. is sufficient, but without a firm foundation a thickness of 4 in. may be necessary to avoid cracking.

For this work you must use a mixture of cement, shingle or gravel and sand. The pieces of coarse aggregate, as the shingle or gravel is called, should not be larger than 1 in. and should be graded down to about $\frac{3}{16}$ in. The sand should be clean.

The quantities required per square yard for a thickness of 2 in. are: cement 33.2 lb., damp sand 0.72 cubic feet, shingle 1.11 cubic feet. Multiply these figures by the number of square yards required to give the total amounts.

The method recommended by the Cement and Concrete Association is as follows: remove turf, etc., and consolidate the ground by rolling or ramming. In the case of soft ground spread a layer of rubble, clinker or similar material over the site before consolidating the ground.

Lay strong pieces of wood of a depth equal to the thickness of the concrete required—say, 2 in.—and drive in a few pegs to keep the forms in line when the concrete is being placed against them. Fix cross pieces every 5 ft.; these may be either thin softwood laths, left permanently in place, or temporary boards of stouter section. In the former case the concreting is done continuously from bay to bay, but in the latter case alternate bays are done first and the cross pieces removed when the concrete has hardened, after which the intermediate bays are concreted. Cross joints formed by either method are necessary to prevent risk of subsequent contraction cracks or warping of the slab due to expansion.

If the ground is dry, damp the surface before depositing the concrete; but if the ground is wet and muddy spread old newspapers over it and place the concrete on top of them. Mix enough concrete to complete one bay. It should be deposited within half an hour of commencing the mixing. Fill one bay at a time, spreading the concrete with a rake and working it well into place to a height about $\frac{1}{2}$ in. above the top of the side forms.

Level off the concrete by working a piece of wood, shaped to give a camber of $\frac{3}{8}$ in., forward over the surface, first with a chopping motion and then with a sawing action, resting the wooden screed on the side forms. A slightly rippled surface may be produced in this way. A smoother surface may be obtained, if desired, by subsequent “floating” with a wooden trowel, but this should not be overdone if fine cracks at a latter date are to be avoided. It is very important to protect freshly placed concrete from the drying action of sun and wind, so as soon as the surface has set sufficiently hard cover it with wet sacks and keep them damp for ten days.

To expose the shingle, the surface should be brushed with a hair broom to remove the surplus mortar about an hour after the concrete has been placed. When the concrete has hardened sufficiently so that the stones are not dislodged, the surface should again be brushed with a stiff broom, leaving the stones slightly

proud of the surface. By using a buff coloured cement or adding pigment to ordinary cement, the appearance of a well-rolled gravel path may be obtained.

The same method may be used for making concrete drives for cars but the concrete should be at least 4 in. thick—thicker if the ground is weak. Well roll or tamp the ground before commencing, and if it is soft lay a foundation of ballast, as previously described.

Tarmacadam

This consists of an aggregate such as gravel coated with tar and spread and rolled on a foundation of ballast. Using bituminous material there are various hot and cold processes. This is not work for the amateur. In all districts there are specialist firms who will quote for paths and drives.

STEPS, TERRACES, WALLS

In these constructional jobs there is often a considerable amount of work—much of it hard work. If you have never done any bricklaying or masonry work before start with a small job. Two or three steps, for example. If you take on a long garden wall for your first job you will make a lot of mistakes, find that it takes much longer and is much harder work than you expected and you will probably give up in disgust before you have got far.

Materials

You can use stone, pre-cast concrete blocks, poured concrete or brick. And, of course, you must mix some mortar, for which one part cement to four parts clean sand is suitable. This mix is quite strong enough. Anything stronger will not work easily off the trowel and will tend to shrink and crack. A strong cement mortar also causes efflorescence more readily than a weaker one.

I think stone of good colour and texture is the most pleasing material to use, but thin bricks of a dark colour, or multi-colours, and rough texture are perhaps as good looking. Concrete lacks the interesting tones and textures of these materials, though the grey colour is not the only one available—you can

buy coloured cements, and the buff is perhaps best. But concrete is very appropriate in making a garden to harmonize with a modernist kind of house. It is also quite suitable for formal gardens, especially if products with highly finished surfaces are used.

Pre-cast blocks can be made by the amateur in the way already described for making paving slabs, except that the blocks should be 3 or 4 in. thick. But the rather heavy work of making a large quantity is best avoided by buying manufactured blocks, of which there are a variety of sizes. Manufactured steps, copings and edge units for borders can also be bought.

Poured or "in situ" concrete looks well in a formal or a modernist garden. It lends itself well to simple shapes and flush surfaces. An interesting texture can be produced by brushing the surface before it has set hard—provided the formwork can be safely removed in time.

With poured concrete the labour of handling and laying individual blocks is avoided, but against this you have the carpentry work of making and erecting the forms. These forms must be strongly made so that they will not move or bend under the pressure of the wet concrete. And they must, of course, be made so that they are easily removed. The interior surfaces must be oiled or coated with whitewash to prevent the concrete sticking. To make a strong concrete use a mix of one part cement, two parts damp sand and three parts shingle or other hard clean aggregate. They can be measured in these proportions in a bucket.

Brickwork, using thin dark or multi-coloured bricks as already mentioned, looks very attractive in the garden. If you can buy some old thin facing bricks they will look even better than modern facing bricks. It is not difficult to make a satisfactory job of brick-laying provided no large surfaces are involved. With a large surface any imperfections will be quickly noticed, and it is impossible for the beginner to do first-class work.

For brickwork, masonry and concrete blocks use a mortar mix of one part cement to four parts sand with rather thick joints— $\frac{3}{8}$ or even $\frac{1}{2}$ in. If you rake the joints out with a stick having a rounded end it will produce an interesting textured joint into which shadows will be thrown.

Steps

Well proportioned steps make a pleasing feature in any garden, and as few gardens are quite level the opportunity is usually at hand to make at least two steps to a low terrace or as a break in a path. To construct two or three steps up to 4 ft. wide is a fairly simple job which the beginner can manage without difficulty, and the experience gained will enable you to follow up with something bigger.

Good proportions are important. Each step should be at least 12 in. in depth with a shallow rise of about 4 in. Steep steps look clumsy.

There are two types: open steps with returned ends, and steps with the ends closed by dwarf walls or piers. See Plates III and V, A, following p. 312.

If you use natural stone get some narrow paving slabs for the treads, and the risers between the steps can be built up with small stones 2 or 3 in. thick. The treads should overhang the risers by about 1 in. For closed ends thin or thick stones can be used. If you build piers finish them with slab copings or brick-on-edge.

Curved steps as illustrated on Plate III are attractive and simple to build. Set them out by using a trammel or length of string tied to a centre peg, as described under "Setting-out" (p. 262).

When preparing the ground, if it is reasonably stiff you can cut the bank roughly to step shape. Start building the bottom step and work upwards, but take care to check all your dimensions before you start. On weak soil or with a long flight of steps

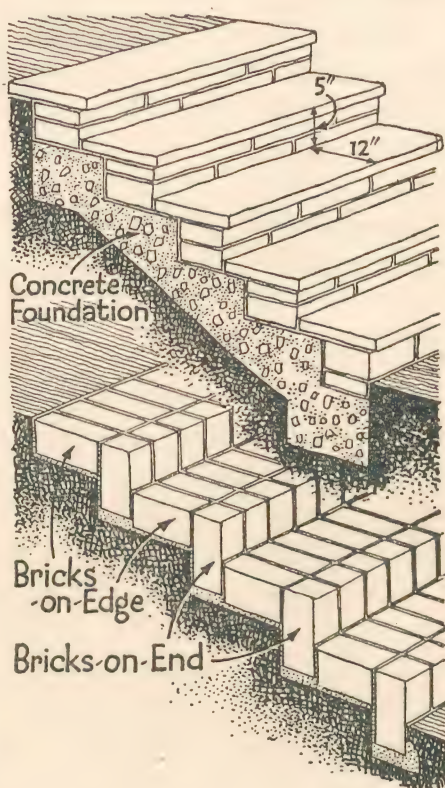


FIG. 3

Top: Steps of stone or pre-cast concrete—the concrete foundation is necessary on weak ground

Bottom: Brick steps set in mortar. On very compact dry ground no concrete is necessary

give the bottom step a deep foundation by placing concrete in a trench at least 12 in. deep.

Pre-cast concrete steps can be built as just described for stone but use narrow paving slabs for the treads. If the slabs are, say, 18 in. and you are making your treads only 12 in. you can let them overlap, the riser being built on the back part of the slab.

Bricks make excellent steps. Lay them on edge or on end. As bricks are barely 9 in. long it is best to form the treads as shown in Fig. 3, using brick-on-end at the front and brick-on-edge at the back, giving treads about 14 in. deep with a rise of about $4\frac{3}{4}$ in.

Steps should have a slight outward slope so that rainwater runs off them.

Terraces

If the ground slopes away from the back or one side of the house it is quite easy to make a raised terrace. But even if it is level you can make a flat terrace with the surface about 4 in. above the ground. But you must take care not to cover the damp-proof course and to give the surface a slight outward slope (1 in. in a width of 8 ft. will do) so that rain-water will not stand against the house wall.

If the ground slopes steeply from the house wall you will need some filling to form the terrace. You might get this from a bank in the garden or by forming a sunk lawn or pool, or may find a local builder who will be glad to dump some surplus soil from a building site. Hard clean ballast, broken bricks, etc., will really be better than soil, and sandy gravel is quite suitable. But whatever the material ram it well to consolidate it and when you have finally made up the surface ram it again or roll it.

Now you must decide how to retain the terrace filling. That is, to keep it from sliding forward. If it is a natural bank of very firm soil it will not do this provided you slope the front of the bank back at 45 degrees. But even if it is filling or loose soil, provided you have rammed it well a bank will keep it back, especially if you turf the bank or bury stones in it to form a rockery. By the way, if you finish it as a rockery make it an irregular slope with parts of it extending well forward. A

straight bank looks too formal, and a formal rockery is very much out of tune.

Another way of retaining the terrace is to build a retaining wall as illustrated in Fig. 4. You must make a strong job of this and the higher the terrace the stronger the wall must be. Up

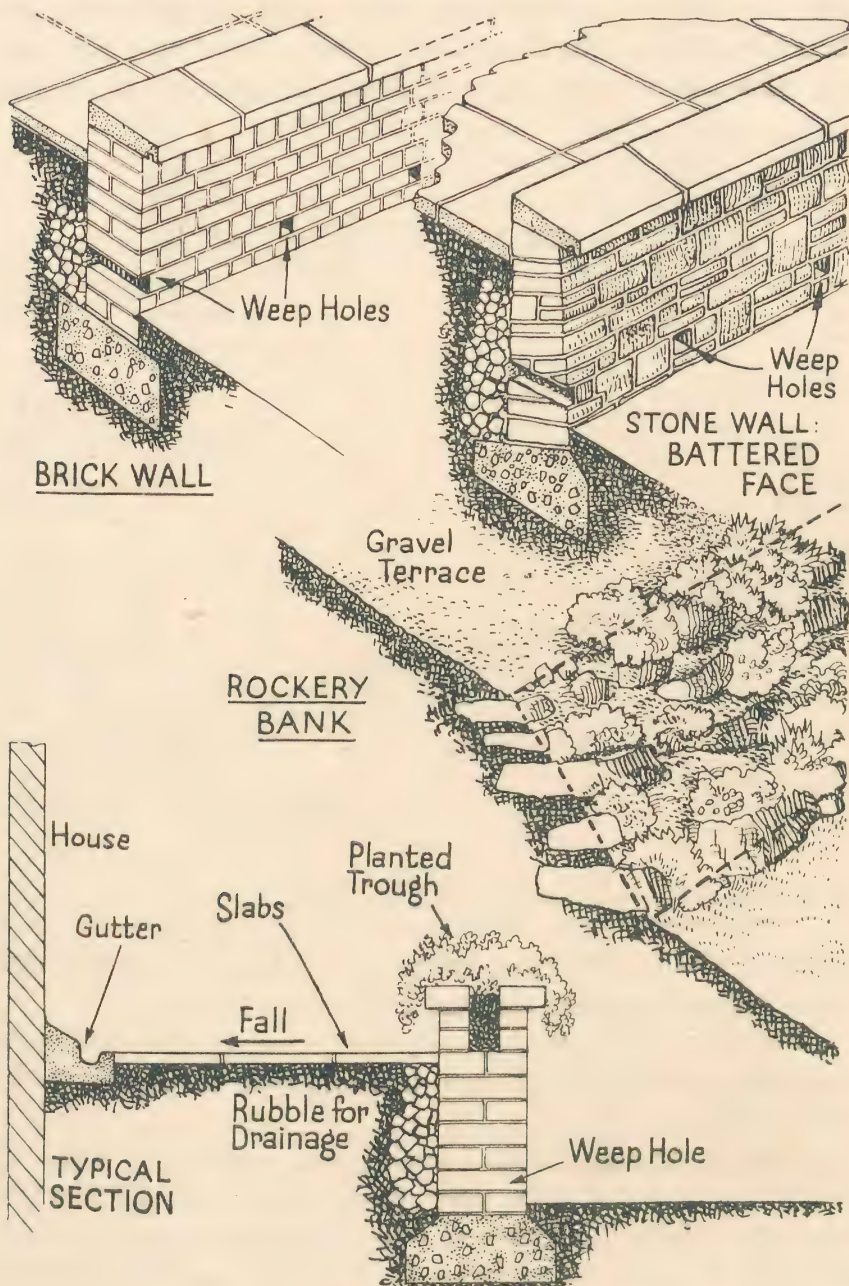


FIG. 4. TERRACES AND RETAINING WALLS

to 2 ft. 6 in. high a thickness of 9 in. is sufficient—above that 14 in. is necessary. If the wall is longer than 30 ft. projecting piers or buttresses should be built at intervals of 10 to 12 ft.

It is essential to provide weep holes in a retaining wall to allow any water in the terrace filling to drain. In a wall up to 2 ft. 6 in. high one row of holes 18 in. apart will be ample, and these should be placed about 6 in. up the wall. Above 2 ft. 6 in. it is safer to provide two rows of holes, the upper one nearly half

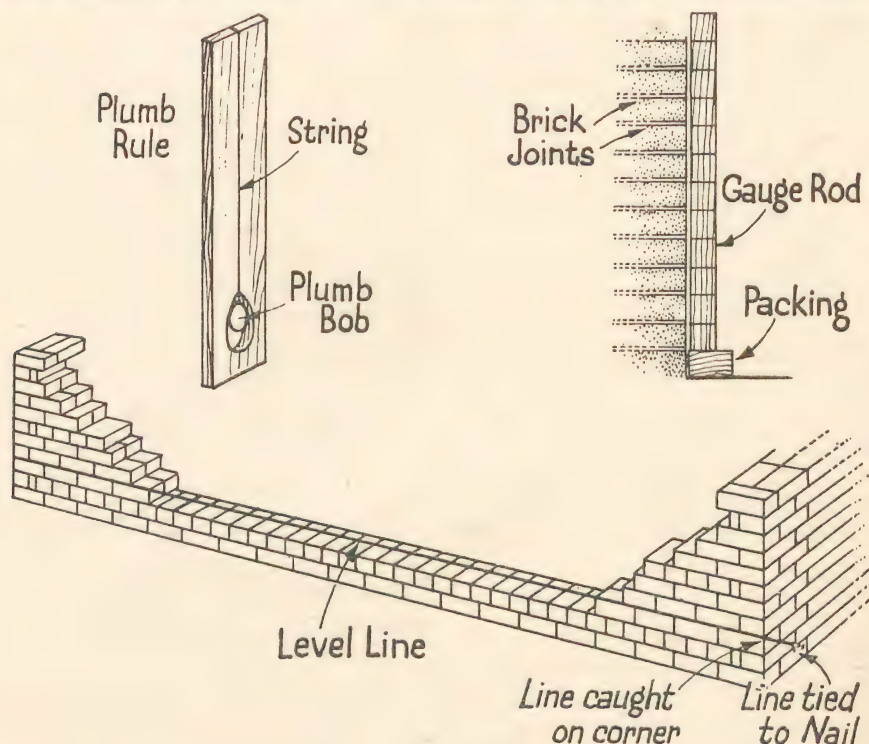


FIG. 5. BUILDING A WALL

Build up the corners first. Then stretch a line to which the courses of the main wall can be built. Use the plumb rule to keep face vertical and the gauge rod to keep courses even

way up the wall. Stones or rubble should be placed at the back of the wall so that water can run freely to the holes.

If the terrace filling is very soft, such as fine loam or sand, and the wall is more than 2 ft. high it is advisable to slope it backwards slightly.

You must provide a firm foundation to a retaining wall. It should be at least 1 ft. 6 in. deep; more if a firm subsoil is below this level. Make it of concrete 6 in. thick and 1 ft. 6 in. wide, and if the terrace is more than 3 ft. high add 2 or 3 in. to these dimensions.

Let the foundation concrete harden for at least twenty-four hours before you start building the wall. Fix a line as a guide for the first course. Assuming that your foundation is level you will have no difficulty in keeping the first course or two level. If you are using random blocks of stone or concrete, some being thicker than others, you will not have continuous courses, but keep each block fairly level. Brickwork must, of course, be laid in level courses.

For brickwork or regular coursed blocks build up the two ends of the wall first, taking care to keep the courses at the same height at each end. If you mark the courses on a lath and use this as a guide, standing it on the foundation, you cannot go wrong. When the ends are up, as in Fig. 5, fix a line, taking care that it does not sag, and lay your course right along the wall to this line, raising the line for the next course, and so on.

In laying bricks or blocks, take a trowel full of mortar, drop it on the wall bed and spread it with the trowel until it is a little thicker than the finished joint. Now place the brick as accurately as possible, press it into the mortar and if necessary tap it to bring it level. In the case of bricks the "frog" or hollow part of the brick should be kept upwards. At first check your work frequently and take the brick off and relay it if the first laying is faulty. After you have been working for about half an hour point the joints. You can either make a smooth joint by using the trowel or rake it out with a stick having a rounded end.

As you work keep the face of the wall clean. Wipe off surplus mortar with the edge of the trowel and clean off any mortar smear with a wet rag.

You must keep the face work plumb as well as level. You can make a plumb rule. The plum bob can be bought at an ironmongers. Or you can use a long spirit-level with a built-in cross levels. This is used in the upright position, the cross-level bubble being brought to the centre.

If your wall is battered, that is, has a backward sloping face, cut a board so that one side slopes to the required batter and hold your plumb rule to the upright side in testing the batter face.

The terrace will be better paved with stone or pre-cast slabs than surfaced with gravel. The slabs can run over the top of the wall if it is not too high, but it makes a better finish to build

up the wall and form a trough at the top for planting. If the terrace is very high it is advisable to build the wall up two or three feet to give protection to people using it, or to fix a wooden balustrade.

Planted walls

There are two ways of planting walls: first, by leaving open pockets or joints in the face work; and second, by forming a trough at the top for top planting, as in Fig. 4 (bottom).

What is usually termed Dutch Walling consists of laying stones "dry"—that is, without mortar. For this you want large stones and you must take care to bond them well so that they hold together. If you make a terrace or retaining wall in this way batter it—that is, let it slope backwards—to reduce the overturning tendency. A better method is to set the back of the wall in mortar and also about half the joints at the front. Or you can leave pockets at the front of the wall, and I think this is the best method as you can get plenty of soil in the pockets and so use such plants as aubretias which require a fair amount of soil.

Top planting can be very attractive, and if the trough holds plenty of soil you can use almost any kind of dwarf plants. A depth of about 6 in. is sufficient. Line the trough with cement mortar but place drainage holes at intervals of about 12 in.

Boundary walls

There is a lot of work in long and high boundary walls, so do not undertake such work unless you have plenty of time and energy, and also some experience. But low walls up to 30 ft. long are within the capacity of the average handyman. For example, you might build a front boundary wall about 18 in. high from ground level, and if you have an attractive front garden this will allow it to be seen. Incidentally it will not take the light from it as a high wall or fence does. You can use rubble stone, rough-textured brick or concrete, as already described.

Ornamental walls

In large gardens these can be effectively used for dividing and breaking up the layout. Such walls should be low—2 ft. is

enough. They should not be unduly obtrusive. Indeed all constructional work in the garden should be subordinate to the planting scheme. A good example is illustrated in Plate I, A.

Take a trench out about 9 in. deep and a few inches wider than the wall and fill to within 2 in. of ground level with concrete. This will be sufficient foundation for a wall up to 2 ft. high, provided the trench bottom is firmly consolidated. An exception is where there is clay which is liable to shrink in dry weather and crack. Then you must go down at least 2 ft. to avoid disturbance.

FENCES, HEDGES AND GATES

There are so many ways of enclosing gardens, some very costly and some cheap; some enhancing the appearance of the garden and some spoiling it; that very careful consideration should be given to the matter.

The point you should pay most attention to is durability, and it is a point which a few people consider at all. If you have wooden fences you must protect them against rot or they will last only a few years. And let it be clearly understood that a brush application of creosote gives protection for not more than twelve months.

If you have brick, stone or concrete walls remember that they are exposed on all sides to the weather, and the materials and workmanship must be of the best if they are to endure.

Regarding appearance, remember that the higher the fence or wall the more prominent it is, and the more light it will take from the garden. The last point is very important if the fence shields the garden from south light. If you want a flower border close to the boundary it is better to have an open paling fence than a close-boarded fence or wall, And in such a position it is certainly not advisable to plant a hedge or the roots will take most of the nourishment that the flowers need.

If you must have a close-boarded fence, wall or hedge it is advisable to have a path next to it with the flower border on either side of the path. And this has the advantage of allowing you to get at the fence or wall easily to do repairs, or in the case of a hedge to clip it.

Open fences

The cheapest type of open fence is the cleft chestnut wired fence. This is bought ready made in rolls for fixing to posts or stakes. This is not a bad looking fence but the wire rusts after a few years. You can prevent this by painting it with bituminous paint after fixing.

Another cheap type is the stretched wire fence; galvanized wire being stapled to posts. This is all right to mark the boundary and provide an enclosure where hedges or evergreens shrubs are planted.

The pale type of fence, illustrated in Fig. 6 is of better appearance than the two just described and for heights up to 4 ft. is not expensive. You can make and fix it yourself, and it is quite an easy job if you buy the material ready cut to correct sectional sizes so that you merely have to cut off the lengths required and notch the posts to receive the rails.

To make a substantial fence the posts should be 5 in. by 3 in. with about 18 in. buried in the ground. The rails 3 in. by 2 in. and the pales $2\frac{1}{2}$ in. by 1 in. The construction is easily followed from Fig. 6 (top).

If you would like a rose-coloured fence, nail on the pales in two diagonal sets, as shown in Fig. 6 (middle). Plant rambler or climbing roses against the posts and train the shoots in and out the lattice of the fence. Thin rustic branches can be used for these pales at a lower cost.

Close-boarded fences

For complete privacy a close-boarded fence as illustrated in Fig. 6 (bottom) is the next best thing to a brick or masonry wall. I say "the next best" because a wall is more durable than a timber fence and usually better looking.

The fence should be at least 5 ft. 9 in. high. To make a substantial job use the larger of the two sizes given as follows, though the smaller will do if cost is the first consideration. Post 6 in. by 4 in. or 5 in. by 4 in. buried at least 2 ft. in the ground. Three rails of triangular section 6 in. by 3 in. or 5 in. by 3 in. and they should be sunk into triangular notches in the posts. The ground board may be 8 in. by $1\frac{1}{2}$ in. or 6 in. by $1\frac{1}{4}$ in. sunk to about half its thickness into the posts so that the vertical boards

stand on top of it. The vertical boards should be at least $3\frac{1}{2}$ in. wide and of the "feather-edge" type; that is, with one edge thicker than the other so that they can overlap. The thickest edge should be $\frac{3}{4}$ in. or little less.

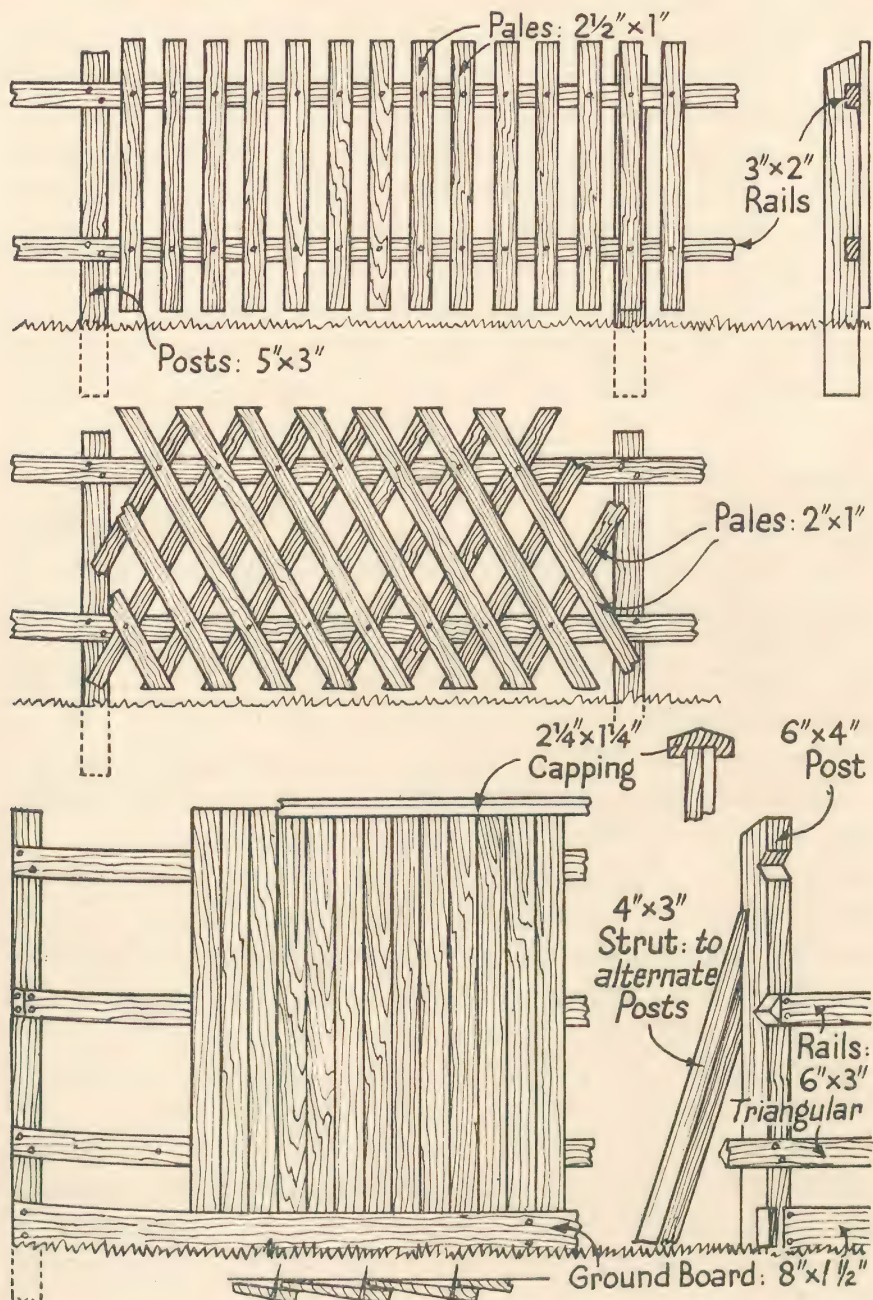


FIG. 6

Top: Pale fences

Bottom: Close-boarded fence

A close-boarded fence has to withstand considerable wind pressure and the posts should be very firmly set on the ground with alternate posts supported by struts. Do not set them in concrete or when they rot you will have to break up the concrete before you can fix new posts.

It is much better to buy pre-cast reinforced concrete posts. They will cost more but will last a lifetime provided they are not knocked about. If they are hammered or hit with bricks, as is sometimes mischievously done by children, the concrete may be broken off in large pieces. These posts either have morticed holes in them to receive the ends of rails or recesses with holes to which rails can be bolted.

Elm, oak and western red cedar are the best timbers for fencing. Red cedar is practically rotproof, and is certainly worth the extra cost.

Preservation of timber fences

Although oak does not quickly rot it is not, as many people think, rotproof. Elm is a little more durable than deal and weathers to a nice grey tone. But these woods will rot near ground level unless they are effectively preserved, and, as already stated, the familiar brush treatment with creosote will only give protection for about twelve months.

The stumps of the posts and the ground boards are the most vulnerable points. Now you can have timber pressure-treated with preservative but it is a costly treatment. If you have a spare dustbin you can half fill it with creosote and stand the stumps in it, leaving them for at least a week. This will give the creosote a chance to soak into the wood. But even so you should dig the earth away from the stumps near ground level every year and apply fresh creosote.

Another method is to char the stumps in a bonfire. This is the traditional country method, and a very good one too.

By the way, creosote is not the only preservative, nor the best. There are certain proprietary preservatives which impregnate the pores of the wood with mineral salts which are not soluble. These give protection for a much longer period than creosote, though they are more costly.

The ground board can be easily taken off and a new one fitted

when the old one has rotted, but it is better to give it a good soaking with preservative every year so that it will last.

The parts of the fence clear of the ground will not rot so quickly but they too will benefit from periodical treatment with preservative,

Reinforced concrete fences

Posts of this material for use with boarded fences have already been mentioned. It is also possible to buy pre-cast parts for complete concrete fences—the parts being bolted together. There are several patterns, some having open spaces in the form of lattice work and some closed panels. See Plate VIII, B, following p. 312.

These fences cost more than wood, but they will last without attention, and the appearance is good. If any part is damaged it can be taken out and a new one fitted.

Iron fences, though more durable than wood, are rarely used for enclosing private gardens. I suppose because they look rather bare and uninteresting and are costly. If you do happen to have an iron fence keep it from rusting by painting every few years with bituminous paint. And if there are any rust patches scrape them clean before painting.

Hedges

A well-kept hedge looks better than any fence. It costs little and once established usually thrives for many years. But let us admit at once that clipping hedges, if you have a long run of them, to keep them nice and trim is rather tedious work. Privet is the hedging plant which demands most attention since it is, in most situations, the fastest growing. But there are other hedge plants, not so fast growing, and for some situations more satisfactory.

Preparing the ground

Hedge plants like shrubs and trees must have plenty of soil to root in, so do not expect a hedge to thrive on poor stony ground. Nor should you plant them in holes in ground which has not been previously dug.

Take out a trench at least 2 ft. wide and 15 in. deep and break up the soil. If it is stiff or caked soil this breaking up is very important. Any surface turf, if it is free from tap rooting weeds, can be laid at the bottom of the trench where it will rot and help to feed the hedge.

The bed of the trench should be level if the surface is intended to be level, and in a regular slope otherwise. Ups and downs should be avoided, so do any filling that is necessary. In fact parts may have to be banked up, but remember that a bank may become very dry and the hedge will then suffer.

If the ground is of poor quality a bed of rotted manure should be laid at the bottom of the trench. This will make a wonderful difference to the growth of the hedge, and will enable it to fill out into a neat compact mass of twigs and leaves. It is a good thing, too, to spread decayed manure over the surface as this will help to keep moisture in the surface soil until the roots have got well down. Failing manure a mulch of lawn mowings will serve the same purpose.

Hedging plants

Now what shall we plant? Well, it depends upon personal taste and also on the situation and the nature of the soil.

Privet is well known and perhaps too common. But for a heavy soil or for strong winds it is the best hedge plant. Its vigour is almost a fault since it grows so rapidly that one must clip it nearly every week, except in the winter, to keep it within bounds. From plants about 18 in. long it will grow to 6 ft. in six years.

When buying privet insist on the oval-leaved form which is evergreen, except in exceptionally severe winters in exposed places. Golden privet may be preferred for its gay colour and also because it is not such a rampant grower, but it is not so hardy as the green and will not stand a bleak situation.

Privet is not the only hedging plant that will stand up to severe exposure, but it is certainly the cheapest. *Cotoneaster Simonsii* will stand any amount of wind, and is almost an evergreen—the leaves hanging on through most winters. In late autumn and early winter it is covered with red berries and the

leaves turn reddish brown. Pruning is the best way to keep it in shape—clipping makes it look bare.

Other hedges that will stand the wind are *Thuja Occidentalis* and *Berberis Darwinii*. In most positions copper beech does well and retains its leaves through the winter. It makes a good wind break where space is limited as it will grow tall without taking up much depth.

Perhaps the best hedge plant of moderate height is the *Lonicera Nitida*, with small close leaves. It is an evergreen and if looked after retains its thick bushy character with perfectly neat surfaces. Another fine evergreen which makes a neat hedge is the English yew. It will eventually grow to a great size in a suitable situation, but it is very slow growing.

If your garden is in the country and there are cattle in the bordering fields you will need either holly or quickthorn as an outer hedge. Both are very hardy.

For the seaside where there is a lot of salt you cannot do better than plant the tamarix, with its feathery foliage.

For an ornamental hedge inside the garden you need something small and close-leaved. There is nothing better than box. It clips to neat surfaces, does not grow too fast, and is ideal for edging borders or making low divisions between parts of the garden.

Planting

The preparation of the ground has already been described. Deeply dug ground should be lightly consolidated before planting. Then take out a narrow trench to the depth of the roots, using a line to keep it straight. Most hedging plants of about 2 ft. should be planted about 12 in. apart in a single line or 18 in. apart in two lines, the plants being staggered.

Tread the soil well down on both sides while you hold the plants upright. Firm

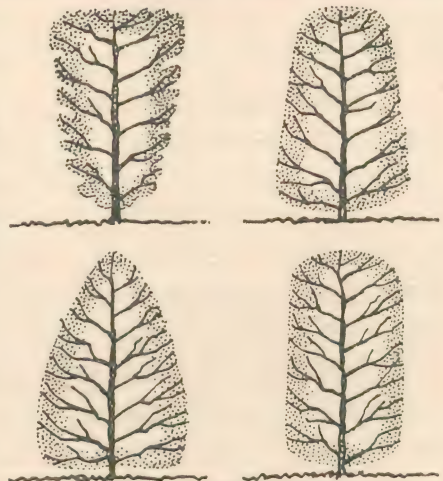


FIG. 7. HEDGE SHAPES
Top left is bad as sides are shaded by overhanging top. The rest are good.

planting is essential. Unless there is rain the plants should be well watered, and if a dry spell follows planting, water thoroughly every few days.

October and November are the best planting months. Early the following spring cut off the central shoot so that the plant will spread out. If the plants are tall and straggling in the first place cut them down ruthlessly. This is the only way to get the hedge to fill out in the lower part. If you check the upward growth for the first three years you will have a nice compact hedge.

In clipping and pruning do not allow the upper part of the hedge to grow wider than the lower—rather the reverse is preferable because it enables the light to reach all of the leaves. Fig. 7 illustrates some good shapes.

When clipping face the clipped portion as this will enable you to keep the lines and surfaces straight.

Gates

Gates may be of painted deal, or of oak or elm left to weather to a natural silver grey tone or treated with preservative. What has already been said about rot and preservation of wood fencing applies also to wood gates. Iron gates are coming back into favour for houses, and have the advantage that the weather does not affect the joints, though they must be kept well painted to prevent corrosion.

A single gate

A typical gate of this type is illustrated in Fig. 8. The joints are morticed, tenoned and pegged, and if the gate is of deal the joints should be put together in stiff lead paint. If you are fairly good at woodwork you will find no difficulty in making such a gate. Select good material free from knots and other faults. Gates are fully exposed to the weather and any faults will soon lead to trouble. Joints must fit exactly as any looseness will cause the gate to sag and allow water to enter the joints.

Posts may be as light as 4 in. by 4 in. for a single gate but it is better to use 6 in. by 6 in. which is stiff enough to take the pull without bending or moving in the ground.

Care must be taken to set the posts very firmly in the ground

and they should be buried at least 3 ft., the soil being thoroughly rammed. The buried portion should be well soaked in preservative.

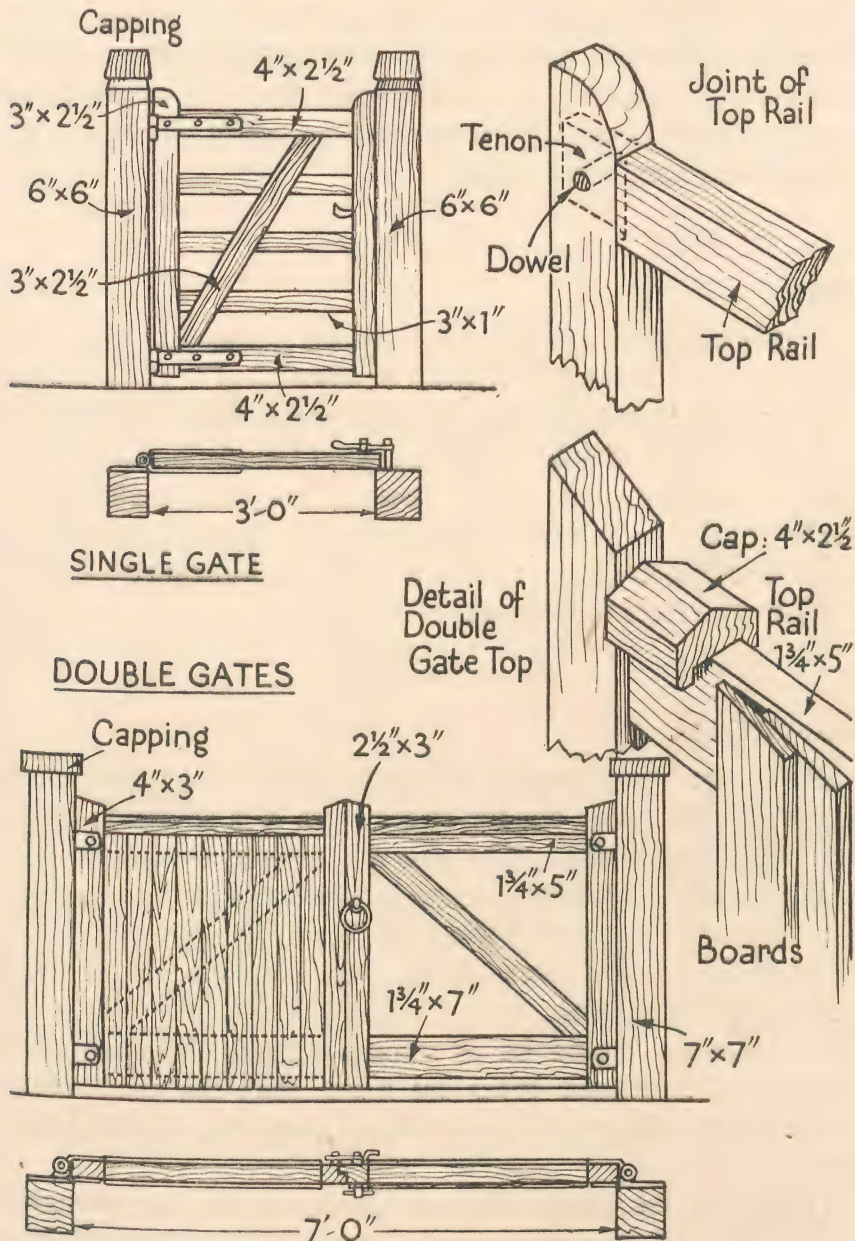


FIG. 8. GATES

A pair of gates

An example is illustrated in Fig. 8. The construction is basically similar to the single gate.

As gates tend to sag by their own weight, if they are wider than 2 ft. 9 in. they should be braced, the brace being a diagonal member which takes the thrust due to the sagging tendency and prevents the rails and stiles falling away from the square. The brace should be placed in the direction shown in Fig. 8 where they are in compression. The reverse direction would bring them in tension and they would serve no useful purpose as the joints would merely pull apart.

Piers

As it is so difficult to give timber posts permanent protection against rot it is better to have brick or stone piers. These should be at least 14 in. square, and, for gates wider than 3 ft., 18 in. is desirable. They should be given a good foundation so that the pull of the gates will not cause them to lean, and the bricks or blocks should be laid in cement mortar. The top should be finished with a coping. Concrete posts, as illustrated on Plate VIII, A are better than wood.

Gate fittings

Strong tee strap hinges should be used for hanging small gates to timber posts, but for larger gates it is advisable to use strap hinges with pins. The pins are screwed to the posts (or in the case of piers have an extension which is built into the pier) and the hinge has a sleeve which is slipped over the pin. The gates can be readily taken off the pins, which is useful when repairing and adjusting.

The fastener should be of strong pattern. Wrought iron fasteners of traditional types are better than the small cheap pressed-metal fasteners now often used for small house gates.

There must be some means of preventing the gate swinging past the post. A stop strip nailed to the post will be suitable for a single gate, but a pair of gates must have a stop block set in the ground. Oak or red cedar should be used for this purpose, though it is better to make a pre-cast concrete block as this will not rot. Make it with rounded corners and of substantial

size—6 in. by 6 in. by 2 ft. Iron stop blocks can be bought and are better than wood.

Some means of holding the gate open is desirable, especially with a pair of gates to a car drive. Metal hooks can be attached to blocks with metal eyes fixed to the gates. But the best fitting is the iron catch fixed to a block. This has a hook at one end and a ball at the other. When the gate is fully opened it engages with the hook.

CHAPTER XXXIX

FURNISHING THE GARDEN

GARDEN FURNITURE AND SUMMER HOUSES

Fine warm weather calls us outside to sit, play games, to have our meals and even to sleep. In Britain we rarely get more than a few weeks of such weather each summer but while it lasts most of us like to live outside. The terrace or lawn becomes an open-air room and we need to furnish it for comfort and convenience. Few people are without deck chairs but they are not suitable for every purpose, as you will know if you have ever tried sitting in a deck chair to have tea outside.

Every garden should have garden seats and a table so that you can have a meal outside in comfort. Now the difference between indoor and outdoor furniture is that the latter can be left out (during the summer at least) and will not be damaged by rain. So there is obviously a big difference in design and construction. Glue joints would soon go to pieces outside, and solid seats and table tops would hold rainwater. When making or buying garden furniture remember this and judge it as much by its ability to stand wet weather as by appearance and convenience.

Seats should be slatted and table tops should be formed as a grid. Joints should be put together in lead paint and most of the joints should be morticed, tenoned and dowelled. The wood must either be rotproof (teak or red cedar) or protected with good quality paint finished with varnish. Metal furniture is good but if the paint is chipped it should be touched up at once to prevent corrosion.

The modern tubular metal furniture for garden use is light and easily handled. The chairs and seats have a wire grid covering to which cushions are attached. This furniture should obviously not be left out in the rain. A dry but well ventilated storage shed should be provided for it, where ordinary deck chairs can also be stored.

If you have only a few pounds to spend and have some elementary skill with woodworking tools why not make your garden furniture. Take your time over it and do a sound job, and do not try to make it all at once.

Making a garden bench

This is a very simple job. The bench illustrated in Fig. 1 consists of three stout pieces of wood with two wedges. Elm and oak are the best woods for this job as they do not need painting and weather to a pleasant silvery grey.

The construction is clear from Fig. 1. The sides have square mortice holes which receive the tusk tenons formed at the ends of the seat piece and the rail piece. These tusks have each a square hole into which the wedge is fitted. Such a bench is "demountable." That is, you can knock out the wedges and take it to pieces—which is convenient when you come to put the bench under cover for the winter.

If you set-out and cut the joints to the sizes shown they will fit snugly together. To cut the square holes take a brace with a bit about $\frac{1}{4}$ in. diameter and drill small holes at each corner of the square. Then with a wide wood chisel and a mallet cut out the remaining wood in the square. You can leave the corner rounded if you round off the edges of the tenons and wedges to fit.

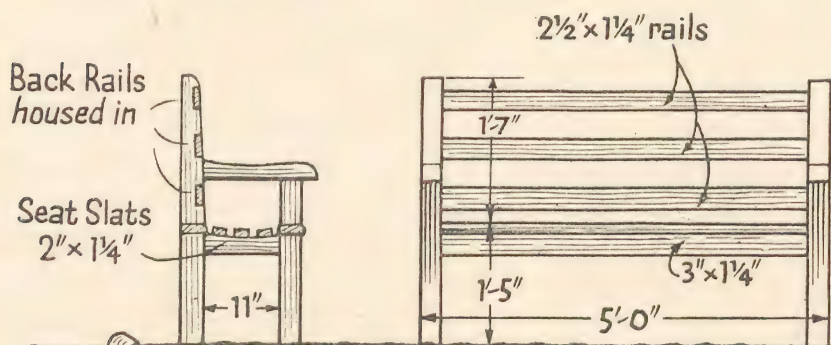
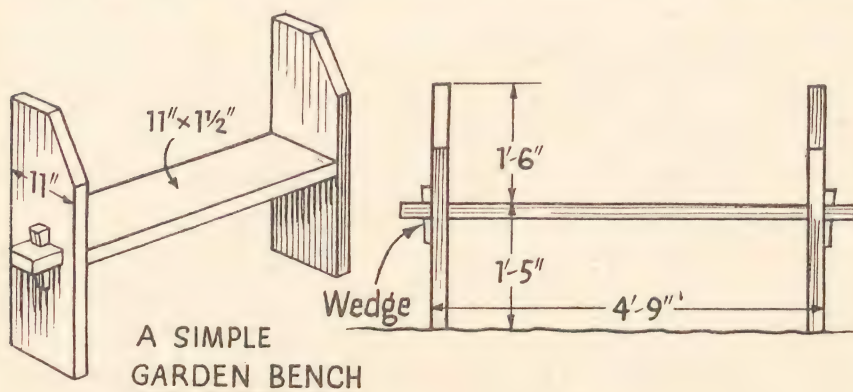
Making a garden seat

This is a more ambitious job, but the seat shown in Fig. 1 is not very difficult to make. You can use material of smaller section than that shown in the drawing, but thin stuff has a weak appearance and the joints do not hold together so well.

For this job use oak if you can get it. It is rather difficult to cut as it is very tough, so you will need sharp tools. Quite an attractive job can be made by using deal, which is softwood, and painting it white or cream. I should like to record my prejudice here against green painted garden furniture; so often used, apparently under the mistaken impression that it harmonizes with natural green. You will find the contrast of white or cream, clean and fresh, much more agreeable to the eye.

In cutting the material to lengths place all similar parts

together on the bench and mark them out together. You can even cut them together if you hold them in a carpenter's clamp. Take great care in marking out joints, and check all dimensions before you set to work with saw and chisel. The frame joints



A GARDEN SEAT

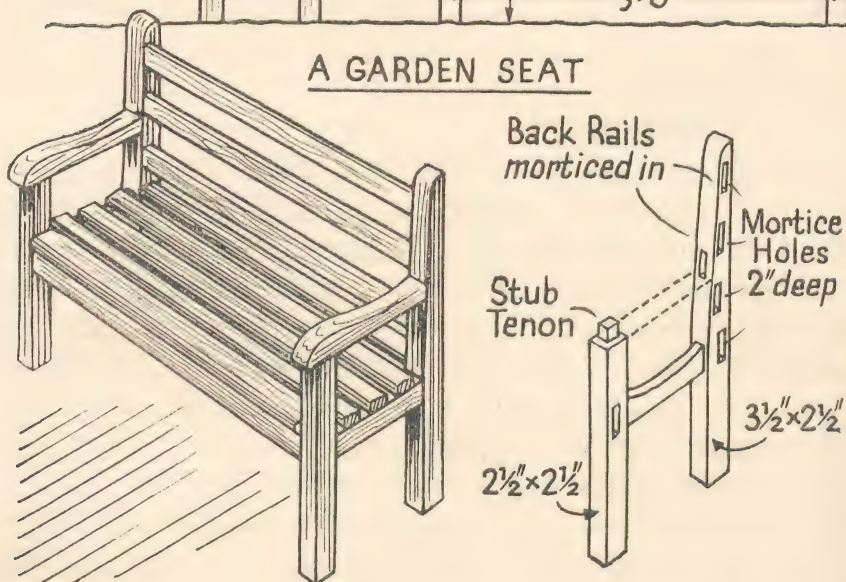


FIG. 1

Top: Simple bench of 1 1/2-in. elm boards

Bottom: A garden seat

are morticed, tenoned and dowelled. You can buy $\frac{3}{8}$ -in. dowelling rod at any timber shop, but wooden curtain rod will serve the purpose. Coat the joints and dowels with lead paint before you fit them together.

Start by making the parts for the end frames. Fit these together and then make the back complete and the seat framing. These can then be fitted to the ends, and finish by making and fixing the seat slats.

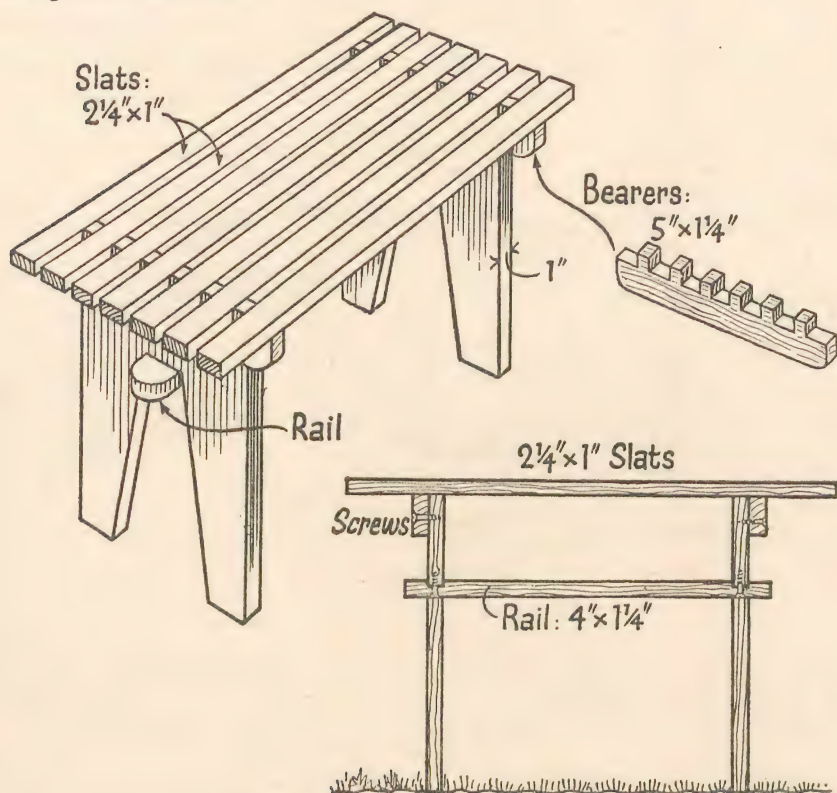


FIG. 2. A SIMPLY MADE GARDEN TABLE

A seat such as this looks very attractive if it is placed in a special setting. You can make a recess in a hedge or shrubbery and pave the space with pre-cast slabs or crazy paving. It is a good thing to have two seats; one in the open and one under the shade of a tree or against a north wall or fence.

Making a garden table

This is no more difficult than a seat, and a fairly simple example is illustrated in Fig. 2. Make it of the same wood as the seat.

The top is slatted to allow rain to drain quickly away. It would be better in the form of a chequer pattern grid, but this involves making a lot of halved joints and making them all accurately—a tedious and lengthy job.

Rustic furniture

I dislike rustic furniture. It looks awkward and it feels awkward. But it has the advantage for the unskilled handiman in being simple to make. There are no cut joints, except where the end of one piece joins another at right angles, where it is

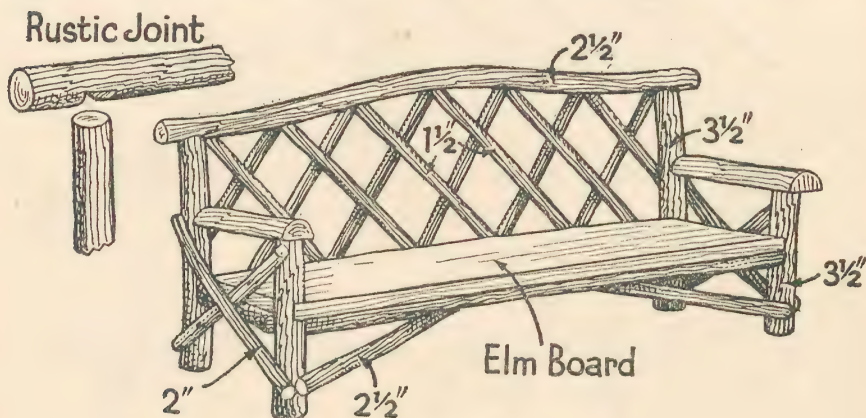


FIG. 3. RUSTIC SEAT
Sizes are approximate

advisable to notch out the second piece to receive the end of the first. All crossings and joints are nailed—3-in. and 4-in. nails being the most useful size for this work.

Rustic poles, usually of elm or larch, are cheap but will soon rot unless given some preservative treatment. Although all rustic work looks better with the bark on, the bark will start splitting and peeling when it has dried, so it is better to strip it off in the first place. You can then use a varnish stain, creosote or one of the proprietary preservatives. Rustic arches and other work will be considered later.

For making rustic furniture select straight material, although bent pieces will be useful for seat backs and for brackets. But if all the material is crooked it will be difficult to fit together. The diameter should not be less than 2 in. for most purposes. A rustic seat is illustrated in Fig. 3.

SUMMER HOUSES

A summer house can both useful and attractive. It is useful as an extra room—an open-air room—in which you can sit and serve meals in that half-and-half sort of weather when there is sunshine and showers or a cool breeze. You can put the deck chairs and cushions in it at the end of the day or when rain threatens. You can let the children use it as a playroom. You can even grow tomatoes in it—though I do not recommend that, believing that pleasure and mere utility should be kept separate.

To look attractive two qualities are required: reasonably good design, which may be quite plain; and an appropriate setting. If you look round other people's gardens you will find good and bad examples.

Avoid the highly ornamental. A plain building of good construction and proportions will look much better than a gingerbread confection of ornamental bits and pieces. But perhaps even more important is the setting. Do not dump the summer house on the garden without consideration. If the garden is a small one, place it in an unobtrusive position or it will attract too much attention. If the layout is formal, place it at the end of a path or on some other axial line—let it be in the middle of something so that it does not upset the balance of the layout. If the garden is informal place the summer house in a recess or a corner with a path leading to it.

A recess in a shrubbery is a good place, in either a formal or informal layout. One or two flowering trees near the front will be pleasant and cast a bit of welcome shade. You will, of course, place it so that the front faces as near south as possible.

Building a summer house

The construction of a timber summer house is not difficult provided you adopt a simple design. The details of timber sectional construction already given in Chapter XVI (see p. 191) should be followed, using 3 in. by 2 in. stuff for the framing.

In Fig. 4 we have a traditional type with walls covered with elm boarding and with the roof covered with shingles, though

tiles would be quite suitable. The design would suit both formal and informal layouts.

But you may prefer a modern flat-roofed summer house of deal painted cream. This is suitable for a formal garden.

Provide a good foundation. If the subsoil is reasonably firm

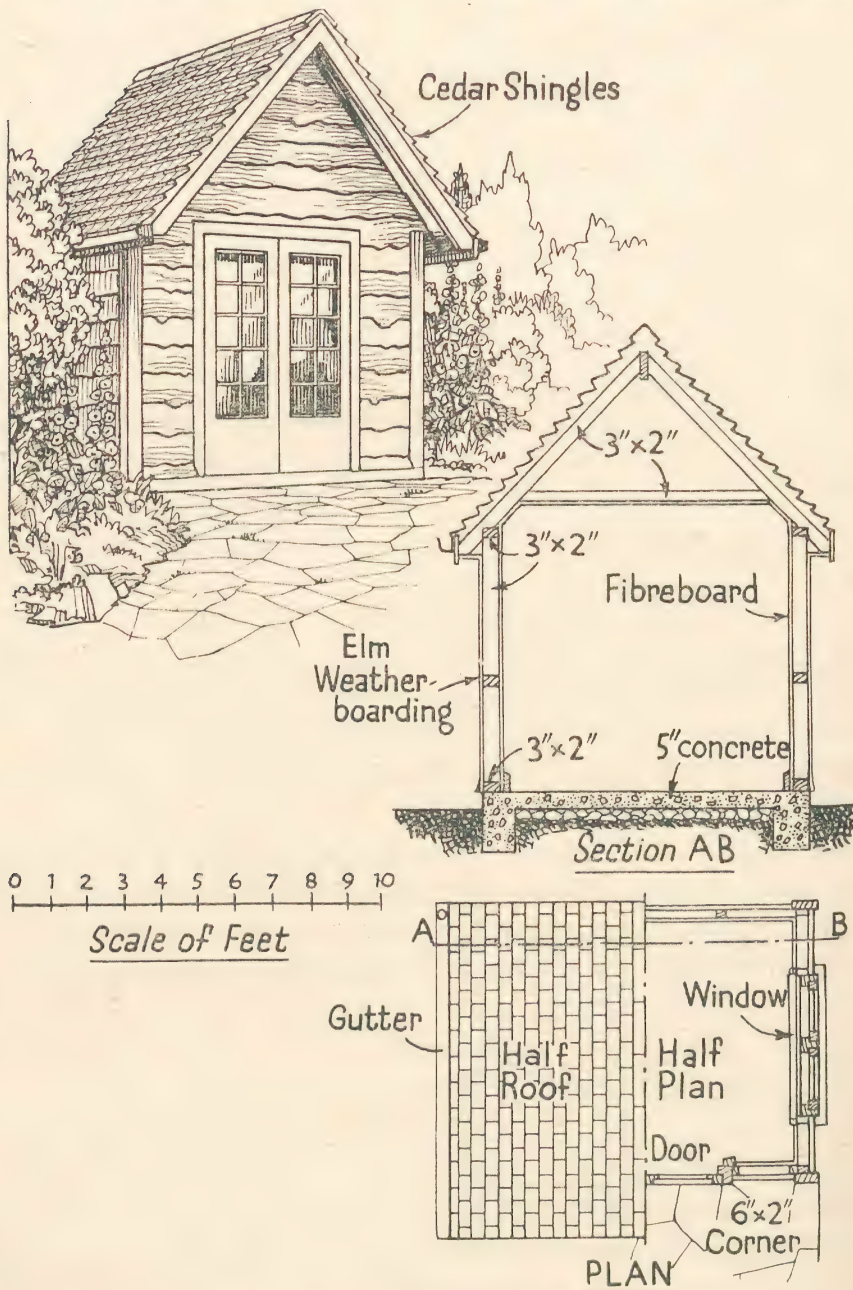


FIG. 4. A SUMMER HOUSE

Inside plan 8 ft. wide $\times$ 6 ft. 6 in. deep $\times$ 7 ft. 6 in. headroom

dig a trench 9 in. wide and about 18 in. deep and fill it with concrete or brickwork in cement. Bring it up to at least 4 in. above ground level. If you are having a timber floor, build in one air brick on each of the four sides just above ground level. And whatever the walls are constructed of lay a damp-proof course of slates in cement or bituminous felt on top of the foundations to keep the walls dry.

The windows and casement doors should be bought ready-made. In fact three sides of the summer house could be built of standard casement doors, and in hot weather this would enable you to have three sides open.

If you want good insulation and a pleasant interior finish, line the inside with fibre-board.

Arbours

While quite different from summer houses, arbours provide pleasantly shady places in which to cool off in hot weather. The construction consists of some form of trellis work, the front being open, and the top having poles or beams with spaces between. You can grow rambler roses or a creeper over it. An arbour is, of course, no place to sit in rainy weather; nor if you object to greenfly, ladybirds, spiders and other insects!

GARDEN ORNAMENTS

I approach this subject with caution and advise you to do the same. Garden ornaments should not only be pleasing in themselves, they should form an integral part of the garden and be subsidiary to it. A garden is a place to grow flowers, shrubs and trees. Ornamental and constructional work should be unobtrusive and assist the planting scheme. Especially in a small garden care is needed not to overdo it.

A path through a rose-covered pergola is a joy provided it does not dominate the whole garden. A sundial, a birdbath, or a statue makes a good focal point at the end of a path or a lawn, but looks distressing if you dump it on the lawn or in some other position which is inappropriate. You should feel that an ornamental feature belongs naturally to its setting. And

remember that one or two ornaments of fine quality are much better than a dozen of poor quality.

Pergolas

The best way to display rambler roses is on a pergola, and, as I have just said, a path through a pergola is a joy. But a pergola takes up a lot of space and it is not for the small garden, unless you grow roses and nothing else, when a path down the middle, pergola-covered, with bush roses in the lawn beds on each side, should compensate you for the absence of herbaceous borders and bedding plants.

Rambler roses grow so quickly and thickly that even a jerry-built pergola of thin trellis work or spindly rustic poles will look attractive until winter uncovers it. But a pergola needs to be strong and durable and when covered with roses has to withstand considerable wind pressure.

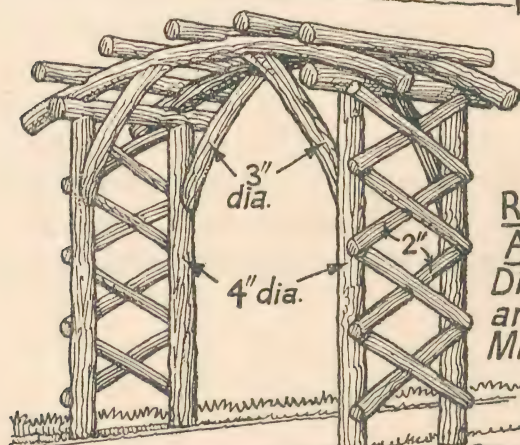
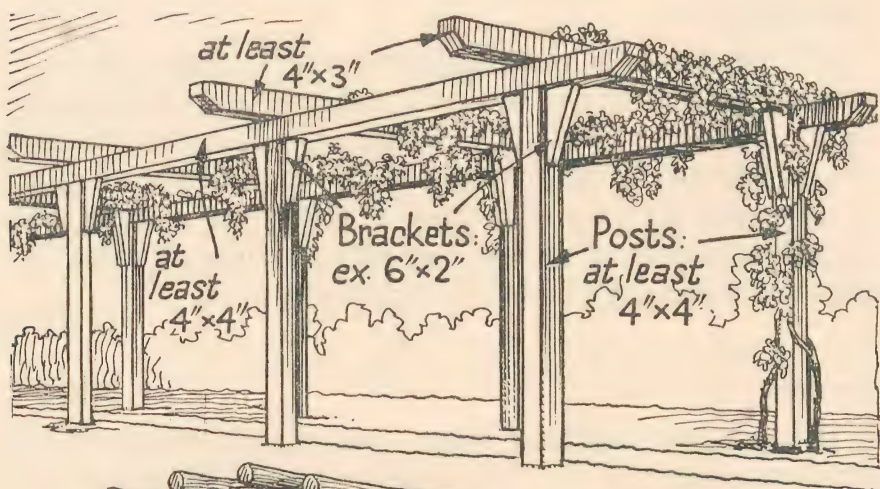
There are two timber types which look good and if properly made will last for many years. The first consists of squared timber 4 in. by 4 in. Oak and elm are the best woods. The second consists of rustic poles at least 4 in. diameter and fairly straight. You can buy these almost anywhere, the available timber being larch and elm.

Fig. 5 (top) illustrates a pergola of squared timber. The construction is simple enough, but some care is needed in cutting the mortices to which the brackets are fitted and dowelled. Let the posts into the ground 2 ft. and give them a good soaking with preservative first, or char them in a bonfire. This treatment should be carried up to 1 ft. above ground level.

Fig. 5 (bottom) illustrates a rustic pergola which is even more simple to construct than the squared timber one. Use 3-in. and 4-in. galvanized nails to secure the pieces together. If the bark is at all loose strip it and apply preservative. Some people use a varnish stain, but it looks sticky and shiny and does not last long.

If you want the most substantial construction build your pillars of stone, pre-cast concrete blocks or brickwork. Provide a good square concrete foundation for each pillar. Build up the pillars in cement mortar, breaking joint. As the work proceeds check with plumb bob and alignment strings. Rake the joints well before the mortar hardens.

Do not lay too many courses at a time on the same pillar. Let the end pillars rise in advance of the intermediates so that you



PERGOLA
in Squared
Timber

RUSTIC
ARCH
Dimensions
are all
Minimum

RUSTIC
PERGOLA

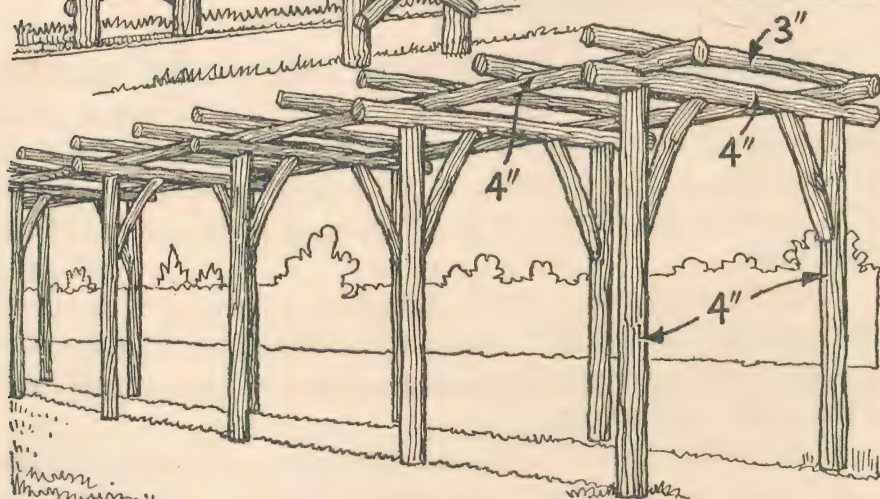


FIG. 5. PERGOLAS AND ARCHES

can stretch a line between them and keep the courses of the intermediate pillars to it.

Trellis work

This consists of a light framing of laths forming a grid. It is useful for making a screen on which roses or creepers can be grown. You can buy lightly constructed trellis work, but it is so very light that it will not stand up for long unless you support it on substantial posts at intervals of about 6 ft. These posts should be connected top and bottom by substantial rails. To this fixed frame you can nail the light trellis work.

Arches

You can have arches of rustic work, trellis, brick, stone or pre-cast concrete blocks. For rustic and trellis arches you need four stout posts let into the ground about 18 in., and two stout cross pieces. In rustic work you can arch the top by using curved branches. The posts and cross pieces may be anything from 18 in. to 5 ft. apart at the sides and should be interconnected with diagonal pieces of light material or trellis work. Each side pair of posts should be connected with a stout piece at the top, as shown in Fig. 5 (middle).

Sundials and Birdbaths

I like sundials, and if there is not much practical point in them these days, they are interesting and if you buy a good bronze dial plate and gnomon and set it on a shapely pedestal at the end of a path, the middle or end of a lawn, or in the centre of a geometrical pattern of flower beds, it makes an excellent focal point.

A small dial plate looks mean, so buy one at least 9 in. diameter. Some makers supply instructions for accurately setting the dial but the following method though not absolutely accurate is near enough and very simple.

Firstly, spread a bed of cement mortar on top of the pedestal. Then with the aid of a pocket compass revolve the dial plate until the sloping side of the gnomon points due south (for

countries north of the equator). You must allow for the magnetic variation, which is not constant, but you can find it near enough from the compass point marked on any recent Ordnance Survey map.

Ordinary sun dials are not accurate time-keepers, though you can obtain tables showing the minutes or seconds to be subtracted or added according to the time of the year, to arrive at G.M.T. There is, however, a dial called the Helio-Chronometer which is quite accurate all through the year.

By the way, when ordering a dial give the latitude of the place of erection, which you can obtain from any good map covering your district.

Pedestals

The height should be from 3 ft. 3 in. to 4 ft. There should be a fairly broad base set on a round, square or octagonal area of paving, and a projecting cap on which the dial is set.

If you buy a stone or pre-cast concrete pedestal choose a simple shape. There are some atrocious examples on the market, and usually these have elaborate carving of very poor quality.

It is quite easy to build a pedestal of brick, stone or pre-cast concrete. A simple brick one is shown on Plate II, A. It is set on a round base of crazy paving.

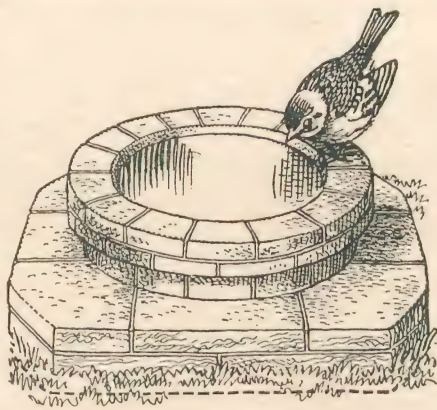


FIG. 6. BIRD BATH OF NATURAL STONE OR PRE-CAST CONCRETE

Birdbaths

These can be set on pedestals or on a base on the ground. The very small ones you can buy look rather mean. Some of the best looking are shallow basins carved out of a block of stone about 2 ft. diameter and 6 in. thick.

Here again is something quite simple to make. You can cast one in concrete, using coloured cement to take off the unpleasant

grey tone. Or you can build it up in small pieces of stone set in mortar and line the basin with waterproofed cement. If you cannot obtain this, use ordinary cement mortar mixed one part cement to two parts clean sand and when it is hard give it two coats of waterglass (silicate of soda; the stuff you use for preserving eggs). This will seal the surface pores.

An example is illustrated in Fig. 6.

Ornamental figures

I must stress again the caution already recommended in considering garden ornaments in general. Carved stone figures (they are also made in cast stone) can look very charming in a good setting. But the quality of the work must be good or when the novelty has worn off they will look absurd and as time goes on will only irritate you.

The setting is very important. Small animal figures may be set at corners—used as punctuation marks, as it were. But do not litter them about the garden. Large figures should be mounted on pedestals and placed where they form a focal point—at the end of a path or in the middle of a flower bed. In these matters one needs unerring taste.

Bird Boxes and Tables

Even if you are not keenly interested in watching birds they add to the attractiveness of a garden, and if you can see them nesting and feeding you will soon take a pleasure in observing them.

Feeding tables and nesting boxes will attract birds to any garden—even in the middle of a town. And in the winter, when the garden is least attractive, the tits and robins, blackbirds and thrushes will bring it to life, especially in a hard frost when they cannot feed on insects and all the berries are gone.

Nesting boxes

Tits, wrens, flycatchers and robins will nest in boxes. It is an advantage to make the box with a removable lid so that you can open it occasionally to see the nest; but do not do this when the parent birds are about!

Make the box about 8 in. square on plan and about 12 in. high. For tits and wrens an inch smaller each way will be better. Make the hole at least half way up, or little more: and for tits and wrens, which are small birds, a diameter of 1 in. is plenty. If you make it bigger sparrows or robins may take possession.

For flycatchers, robins and wagtails make the hole $1\frac{1}{2}$ in. diameter at least. Put the boxes in a quiet position, preferably

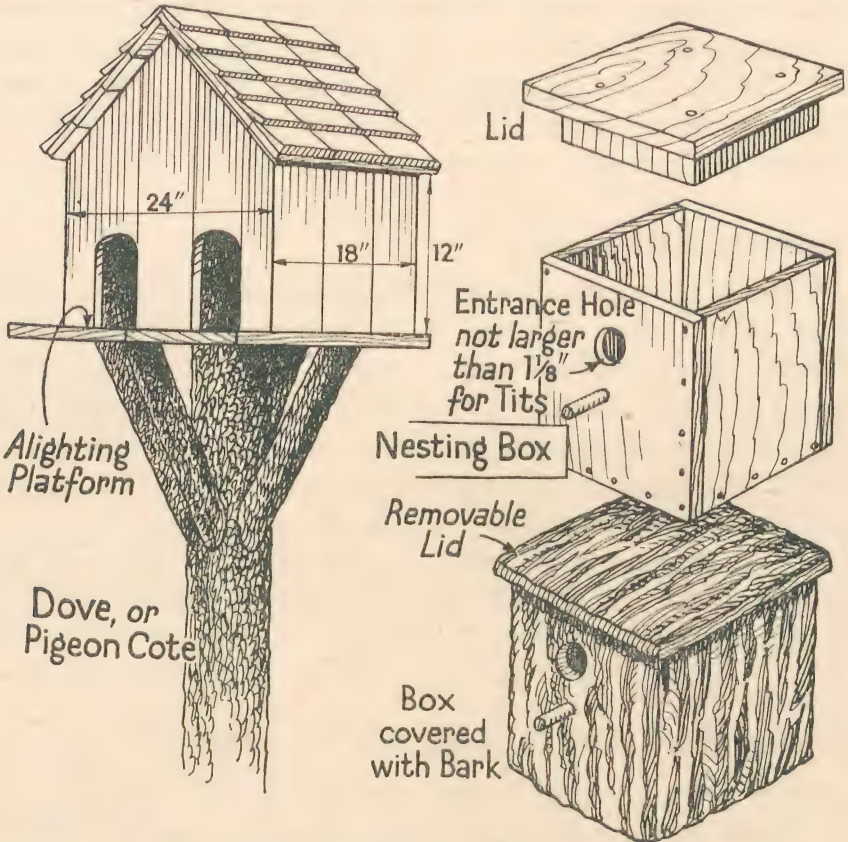


FIG. 7. BIRD BOXES

attached to a tree trunk about 6 ft. from the ground. The early spring is the best time, as the birds will then be returning and looking for nesting places.

The boxes should be painted with an odourless preservative, and if you can cover them with bark or straw thatch it will improve the insulation and appearance.

You can erect the boxes on poles, on walls or tree trunks, but place them in a quiet sheltered spot, facing a northerly aspect so that the hot sun rays will not distress the young birds.

Bird tables

A bird table is just a platform on which you can place crumbs. If you put a hook on the underside and hang a bit of fat on it the tits will greatly appreciate it in cold weather, and will amuse you by their acrobatic feats as they peck at it—feats which are beyond the other birds.

To protect the food from rain and wind it is advisable to fix four small posts to the bird table to support a roof, and with upstanding edges round the table to prevent crumbs being blown off. The table can be mounted on a pole, with a base so that it can be moved about. You can place it opposite a window within a few feet of the house.

Pigeon and dove cotes

A small pigeon cote for a pair of birds can be made in box form about 20 in. square. It must be dry, and the opening should be sheltered by a near-by tree or wall. An alighting platform should project in front. A sloping roof covered with thatch or shingles is best (you can make small shingles from elm or oak boards, planing them to a tapered section). Mount the pigeon cote on a stout post well out of reach of cats and rats.

A large pigeon cote or loft is much better than the small one just described. It should be fitted with shelves 10 in. deep divided into compartments 16 in. wide.

GARDEN POOLS AND PONDS

Water gives a special interest and charm to the garden. In the formal layout it provides the perfect centre piece. To the informal it adds a picturesque touch and provides the right conditions for many beautiful plants which will grow only submerged or in wet ground.

You can have any size from a mere dish to a large pool; though, by the way, a small pool can be given an extra prominence by setting it in a fairly extensive area of paving surrounded by a low wall.

If you have a swampy piece of ground with clay subsoil you can make a fine water garden of it with very little trouble. To do anything else with it would involve draining the subsoil and

making the surface soil lighter by adding loads of light loam, sand or grit.

But you do not need swampy ground or clay subsoil to make a pool. You can excavate the soil and make a concrete "tank" which will hold the water. This, in fact, is the only possible method, unless water already lies in a shallow clay basin.

Whether you adopt a formal or informal type you must consider the design carefully. So now let us go into details.

Formal Pools

The formal pool is of symmetrical shape in a symmetrical setting, though a little graceful variation in detail is not out of place. The shape can be a simple circle, half circle, a rectangle or a more complex geometrical shape.

The pool must be placed in a formal type of setting, though here again slight variations are permissible and will soften any tendency to severity in the layout.

An edging or "frame" of stone or concrete slabs, or brick-on-edge, should be built round the pool. The general setting should extend this "frame," whether it is a lawn or a paved area. But remember to keep the layout well balanced.

The edge of the pool may be level with the rest of that part of the garden, but a good effect is obtained by placing the pool in a sunk lawn or paved area. The tendency is for water to lie in a hollow so a pool in the middle of a sunk area looks natural. You can, of course, build up your pool in the form of a tank, but then it will look artificial. It will look, in fact, what it is—a tank and not a pool. But a tank with stone or brick sides, and a fountain or perhaps goldfish looks very pleasant in the centre of a formal layout.

How to construct a formal pool

First, make a plan, even if it is only a rough sketch. Draw a section, too, and figure all necessary dimensions on plan and section. This will save a lot of hard thinking on the job and will prevent mistakes.

Fig. 8 shows a pool in a paved area. You will see that the pool structure is simply a concrete tank with floor and wall 5 in.

thick. You need a dense concrete made in the following proportions, using a bucket as a measure: take one bucket of loose cement, two buckets of damp sand, and three buckets of shingle or hard stone chippings graded from about $\frac{3}{4}$ in. to $\frac{3}{16}$ in. Mix as already described on p. 272.

Excavate the soil to the shape and size of the concrete tank, taking the overall dimensions. See that the floor of the excavation is level and the sides straight and vertical. Now place the concrete to form the floor, 5 in. thick.

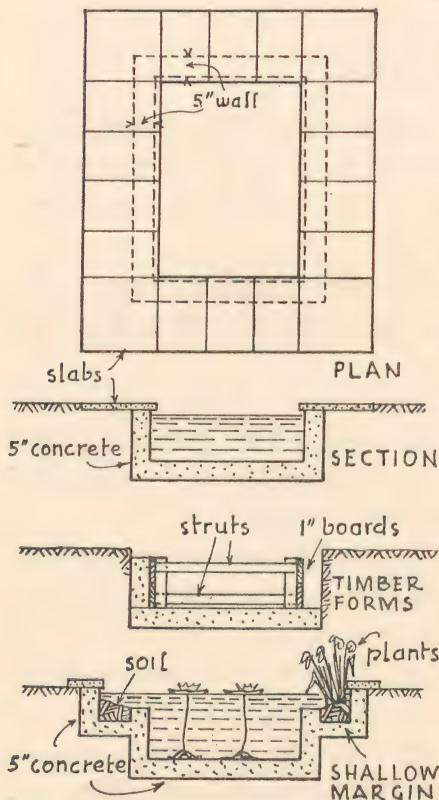


FIG. 8. A FORMAL POOL IN CONCRETE
The edges are paved with concrete slabs. The bottom section shows how margins can be added to accommodate plants

When the concrete floor is hard (in three days if normal Portland cement is used), erect the timber formwork for the walls. This is simply a temporary lining of 1-in. boards supported by uprights of about 3 in. by 2 in. and cross struts, as shown in Fig. 8. This formwork must be firm but easily removable. It should be placed so that the boarded face is 5 in. from the sides of the excavation, and into this space the concrete for the walls is poured. White-wash or oil the boards to prevent the concrete adhering.

You must take a precaution here to ensure good adhesion between the wall concrete and the floor concrete. Wash the concrete floor and then apply a grout (equal parts of cement and sand mixed with water to a creamy consistency) with a brush. The wall concrete will then adhere strongly to the floor and there will be no leaks. Tamp the concrete firmly to drive out air bubbles and produce maximum density.

You can take the formwork down in three or four days, and then partially fill the tank with water. This retards drying and so helps to prevent shrinkage cracks.

Now although the concrete is fairly dense it will allow a little water to soak through and into the ground. There will also be losses by evaporation in dry weather. You can make the concrete tank watertight by treating it with a liquid waterproofer; or silicate of soda as described on p. 124, Vol. I.

If you want the top of the pond sides flush with the paving or lawn, let the paving or edging slabs project an inch over the tank wall. Alternatively you can add a few courses of thin stone or brick to the concrete tank wall and finish with a parapet.

A lily pond

For growing water lilies and other plants which must have water at their roots you need a pool between 1 ft. 6 in. and 2 ft. deep, with 6 in. of rich loam for the root run. It is advisable to have your pool with a cross section like that in Fig. 8 (bottom). Notice the submerged margins which should hold a 3-in. depth of soil with the water coming up to the surface. In these margins you can plant flowering rushes, marsh marigolds, water forget-me-nots, etc.

Before planting the pool let it stand for six months so that the strong alkaline chemicals in the cement can work out. If you are in a hurry fill it with a solution of permanganate of potash and leave for ten days, then empty it and refill with more solution and leave another ten days. You can then empty it, lay the soil at the bottom and plant. By the way, when you have planted the water lilies do not fill with water to the top straight away, as this will do harm to the plants. Run in enough water to cover the crowns and then add a little every few days to keep pace with the growth of the stems.

Informal Pools

Structurally the principles are just the same as for a formal pool. But the design should look natural as though it is a pond which has "just happened." A hollow damp part of the garden is ideal, or if your ground is level you can excavate the soil and bank it up on one side to suggest a natural bank and hollow.

The plan should be irregular and curved, or of kidney shape. Cover the edges with rough pieces of stone, leaving spaces between for growing moisture-loving plants.

The pool shown on Plate IV is an unusual design and very easy to construct. It consists of a shallow basin formed in concrete near the top of a bank with two small basins at lower successive levels. For this design no formwork is needed as you can slope the concrete gradually upwards around the edges.

A large informal pool can be made in a similar way, with sloping sides instead of the upright walls required in formal pools.

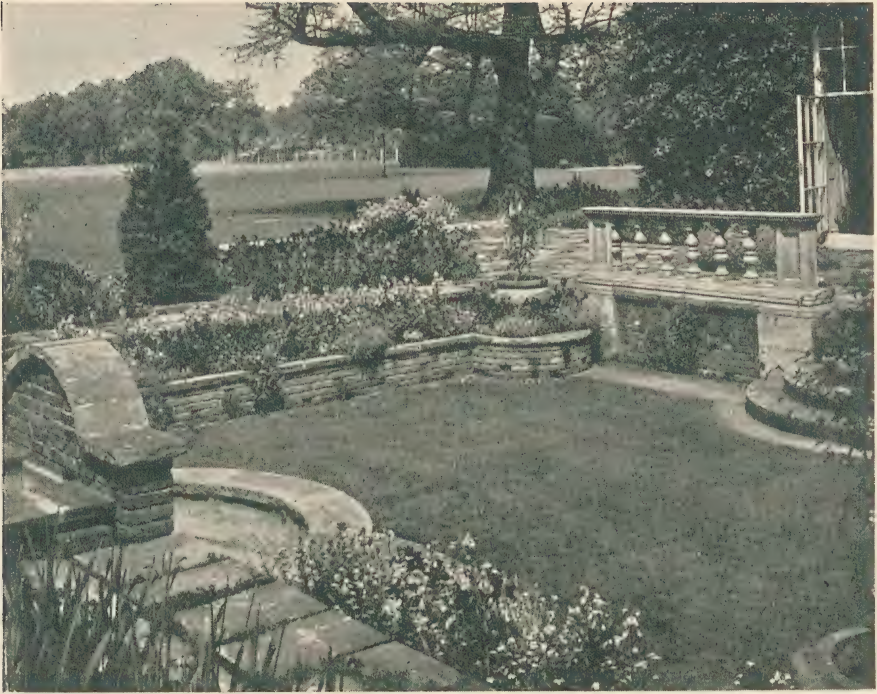
On one side keep an area of ground level with the pool so that you can plant *iris sibirica*, marsh marigolds and other plants which like moist soil, while in the pool itself you can grow water lilies and other plants which must have their roots submerged.

Finally a word about the siting of pools and how to keep them clean. A fairly open sunny position is needed, but sheltered from rough winds. Avoid overhanging trees—their dead leaves will foul the water, they will stop direct sunlight; and some, like the laburnum, have poisonous leaves. If you have a running stream or ditch the pool water will keep clean, but a stagnant pool will keep clean for a long time if you have suitable plants and fishes. A pool in a town garden will have to be cleaned out occasionally owing to the accumulation of soot.

Fountains

A fountain, especially in a formal pool, is very pleasant. If you have a sufficient supply of water at an adequate pressure you can have a fountain, but do not connect the house water service pipe to your fountain or the water authority will strongly object—apart from which you will need an overflow.

The only satisfactory method is to buy an electrically operated fountain pump. This has a watertight motor and pump which is self-contained. You merely place the device in the pool and connect the cable to the house mains. There is no separate water supply or overflow—the pump circulates the pool water, forcing it into the fountain and using the same water over and over again.



A small sunk garden with low retaining walls. Notice the stone balustrade opposite French windows. See Chap. XXXVIII (p. 268).

B



Rubble wall planted with rock plants in soil-filled pockets. Large stones and thick joints should be used in this work. See Chap. XXXVIII (p. 268).

(Photos: Carters Tested Seeds, Ltd.)



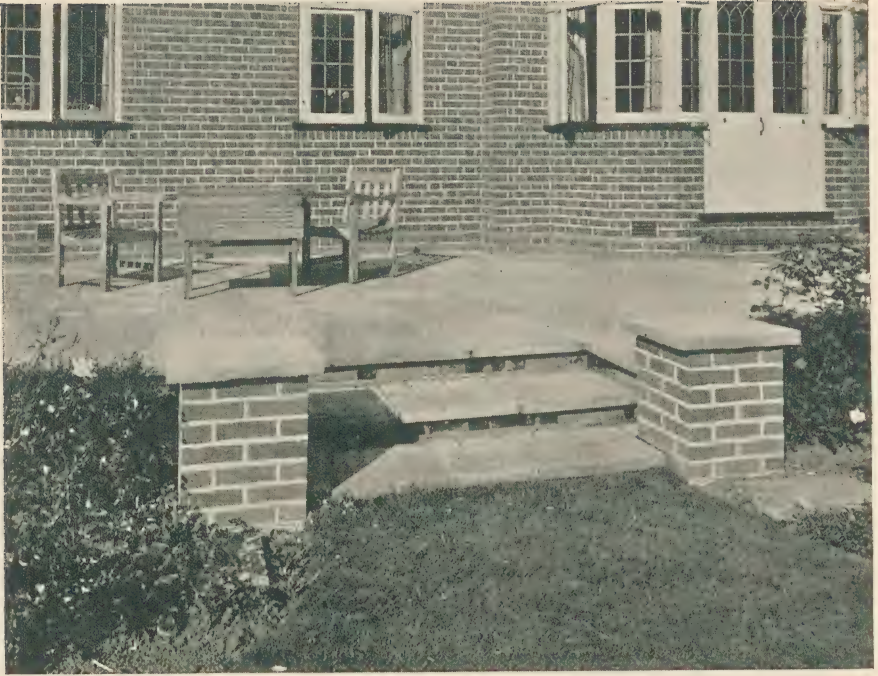
How to make the shallow pools shown below. If a stiff concrete is used it can be moulded to any desired shape. See p. 311.

B



The finished pools with rocks and plants arranged round the edges. See p. 311.

(Photos: Cement and Concrete Association)



Terrace and steps. Pre-cast concrete slabs are used for terrace paving and step treads. Brickwork for piers and step risers. See Chap. XXXVIII (p. 268).

(Photo: Cement and Concrete Association)



A low wall along a raised flower-border with a flower "box" in brick with stone coping. See Chap. XXXVIII (p. 268).

(Photo: Edgar Lucas)

A



Making a pre-cast concrete slab. After screeding a sand bed the wet concrete is spread and screeded with a board as shown. See p. 272.

B



While the concrete is still plastic cut it into any shapes required with the trowel.

C



Crazy paving, made as in the other two photographs, being laid on dabs of concrete placed at the corners.

(Photos: Cement and Concrete Association)



Making concrete path. Lengths of wood are pegged along edges and the concrete deposited in bays. After removing the cross board fill the space with weak mortar to form an expansion joint. See p. 273.

B



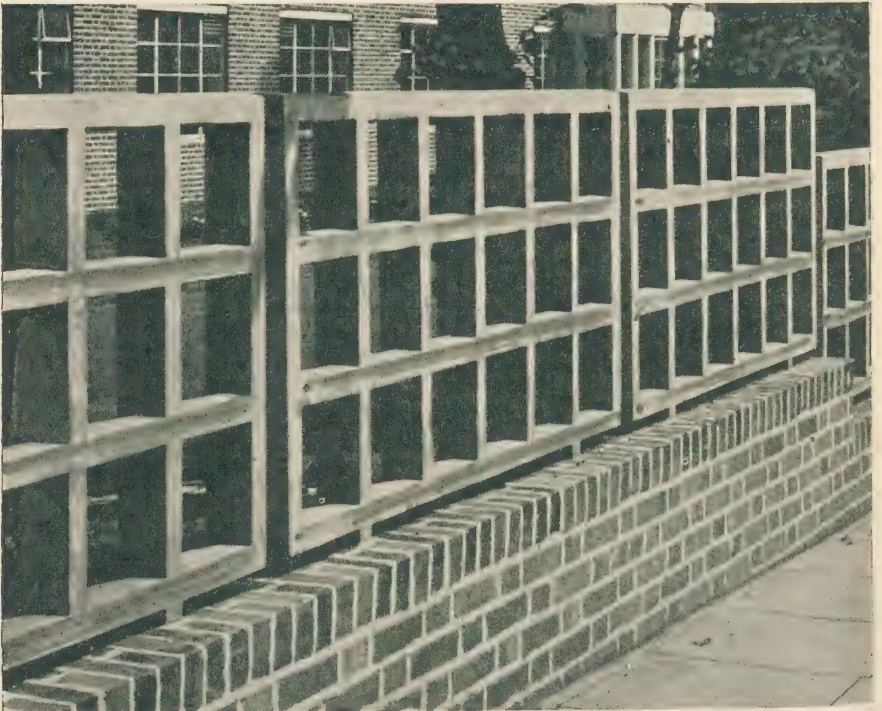
Making concrete path. Surfacing with a board with slightly cambered edge. This is called screeding.

(Photos: Cement and Concrete Association)



Concrete gate posts. The hinge pins are bolted through the posts. Unaffected by weather and cannot rot.

B



Pre-cast concrete fence. Maintenance almost nil, in contrast to timber fence which rapidly rots unless regularly treated with preservative.

(Photos: Cement and Concrete Association)

SECTION VII

CHAPTER XL

MISCELLANEOUS

COOKING RANGES

There are four types of solid-fuel cooking ranges. There is the old-fashioned kitchener, the portable or independent range, the combination range, and the heat storage range. Each type works in a different way and to get efficient service it is essential to know where the flues are and what effects the various dampers and fittings have. In repair work it is necessary to know how the range is set.

The kitchener

This, the old fashioned type of range, is still widely used in the north of Britain and in many country places. Many of the old kitcheners have the merits of generous oven and hot-plate space with a small fireplace which is economical in fuel. But without exception they are ugly and it is hard work to keep them clean. They are made of cast-iron throughout. Most of the visible surface is black-leaded, though the hinges and fastenings are usually of bright metal which are kept clean by the vigorous use of "elbow grease," occasionally assisted by a rub with emery cloth.

The smaller kitcheners have the fire grate on one side with the oven on the other. The top of the oven is flat and a recess is formed to provide a hot plate for boiling. The larger kitcheners have a central fire grate with an oven on each side. As well as extra hot-plate space there is a bright metal plate rack over.

A kitchener is made in separate parts which are bolted together. Some brickwork is necessary to give support to the interior, and in some types part of the oven and grate flues are formed in brickwork.

Usually the oven flues are small spaces passing round the oven. The flue starts at the bottom of the fire grate, passes under the oven and up the far side and then comes over the

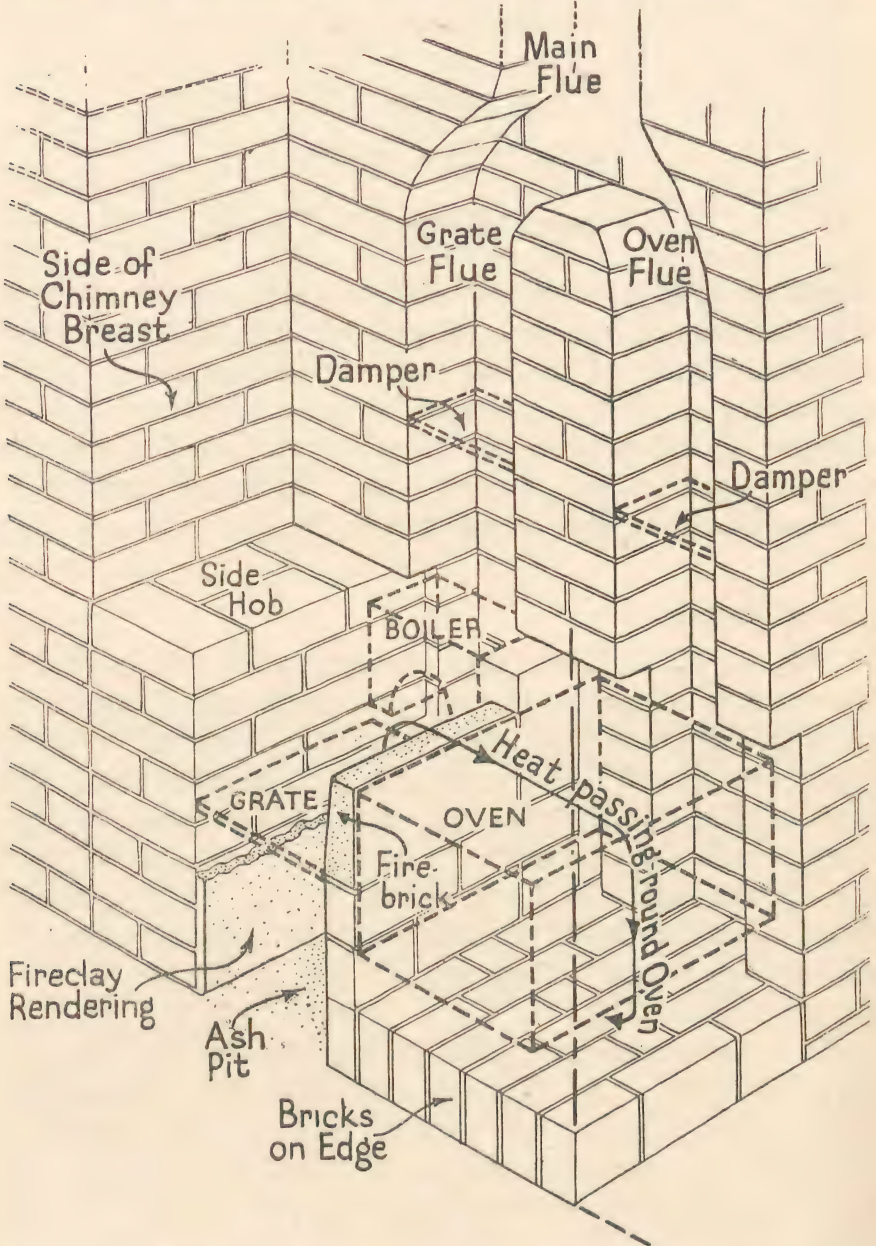


FIG. 1. TYPICAL SETTING FOR KITCHEN RANGE

Notice that there are separate grate and oven flues which join the main flue

oven (where it also heats the hot plate) and back to the main flue. It is obviously necessary to keep these flues clear and access plates are provided for this purpose.

In cleaning the oven flues start at the top and work downwards. By this method all soot and ash will fall downwards and none of it can fall into the part already cleaned. It is, of course, useless to clean only one part of an oven flue. Indeed this may make matters worse since the soot and ash will probably fall into the flue below. Cleaning should be done at least once a week.

If you are taking over a kitchener of an unfamiliar type satisfy yourself that you know how to use the dampers correctly. A little intelligent study will show how they work. In most cases each oven is controlled by one damper. Closing it will close the oven flue so that the oven will not get hot. Full open gives maximum oven heat and the temperature can usually be controlled by intermediate adjustment.

If the range is fitted with a boiler there will be a separate damper for this.

When a kitchener does not work properly, first make sure that the oven flues are clear. Then check the damper to see that it is not broken or displaced. See, too, that the main flue is clear. If the working is still unsatisfactory the trouble is probably due to broken or displaced brickwork in the range setting. Poking about the interior flues will usually reveal the defective work. It will be necessary to take out part of the grate to reach this defective spot. If the screws are stiff and cannot be moved put a drop of thin oil on them and leave overnight (the fire should first be let out).

Although it is advisable to get a skilled repairer to re-set a range, the job can be done by the handiman if he first studies the layout of the flues and makes sure that he understands the working. It is not only necessary to form the flues properly but the back and sides must be built up with brickwork so that no cold draughts can reach the outside of the flues or oven.

If repairs are necessary either to the range itself or the setting, it is advisable to write to the makers. If the range is not a very ancient one they will probably be able to supply an instruction sheet, and also spare parts to replace any that are broken.

Firebrick parts for the fire can usually be obtained from any good builders' merchant. Take the old parts with you so that you can select the nearest size in stock. If you cannot take them make sketches and note the dimensions.

Fig. 1 illustrates a typical setting for a kitchener, but yours will probably differ in some respects. This illustration however will show you the general principles. If you are re-setting or repairing a range yourself it is a good plan to sketch the arrangement of the flues and the setting. This will help you to understand the setting and to avoid mistakes.

Portable ranges

There are two kinds ; the older cast-iron ranges which are black-leaded with some bright metal parts, and the up-to-date

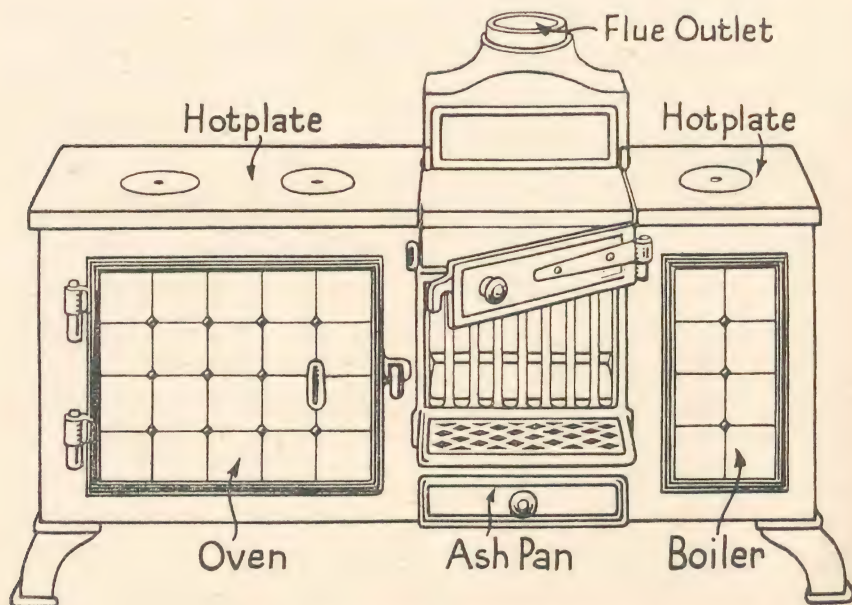


FIG. 2. PORTABLE COOKING RANGE
This type does not need chimney breasts

enamelled ranges. If you are buying a new one, the latter is, of course, the type to buy as it is much better looking and easier to clean than the older type.

A portable range is self-contained. It does not need setting or building-in. Two things only are needed preparatory to placing in position : a solid floor or hearth and a flue connection. You must not place a portable range on a wood floor owing to the fire danger. A brick flue is not essential as a cast-iron or a sheet metal one can easily be fitted outside the building—in which case the range must stand against or near an outside wall. But a brick flue and chimney is better as it looks neater and will

last. If you instal an iron pipe chimney take care to paint it every year with a good quality heat-resisting paint specially made for the purpose. Ordinary oil paints will quickly blister.

A portable range has the fire grate on one side and the oven on the other. The top is flat to form a boiling plate. The range stands on legs so that there is a clear space underneath for cleaning. It should be placed with a good clearance between wall and sides or back so that there is no difficulty in cleaning.

The range is complete and self-contained, and the only installation work is in making the flue connection. If the range is stood in an existing fireplace all that is needed is a short extension pipe to carry the smoke into the existing brick flue. A metal plate should be fitted horizontally round this pipe to seal off the flue opening. The brickwork of the fireplace interior should be rendered in a cement-sand mix and decorated with a cement paint or aluminium paint.

If the flue is in the wall, or there is an iron flue on the other side of the wall, a bend or perhaps a double bend will be required. The foot of the flue should be fitted with a removable cover or soot door for cleaning. It is advisable to have a short extension below the bend so that soot falling down the main flue will not choke the bend. The soot door should be fitted at the bottom of this extension.

A modern portable range with enamelled front sides and door is very attractive-looking (see Fig. 2). It can be fitted with a back boiler for heating water if required, and also with an enamelled splash plate and plate rack over the boiling plate. The grate front is made to close up for slow combustion, and if anthracite is used the fire can be kept going day and night in cold weather. This fuel gives very little ash.

In most makes of portable ranges the oven is removable. This gives a ready access to the oven flues for cleaning. Spare parts are easily obtained from the makers, who will also supply an instruction sheet. It is very important to study this in order to obtain maximum efficiency in working the range. With enamelled ranges care should be taken not to overheat the range as by doing so the enamel in the more vulnerable parts may be cracked.

Combination grates

This description has been rather loosely used in the past to include any kind of self-contained as opposed to built-up grates. But it is now usually restricted to the compact self-contained grates with oven either at the side or over the fire, as in Fig. 3, and the doors are tiled or enamelled. This type of grate needs a brick fireplace with chimney breasts but otherwise it is self-contained, though the space at the back and sides between the grate and the fireplace brickwork should be built up solid to prevent cold draughts circulating round the oven and grate.

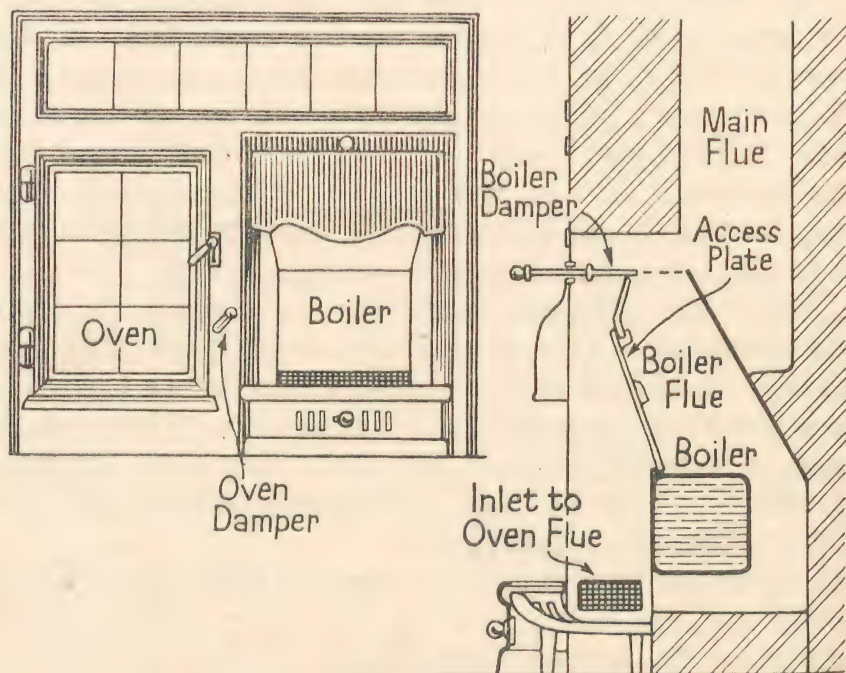


FIG. 3. A COMBINATION GRATE

The interior flues pass around the oven and are controlled by dampers. Small removable cover plates are provided to give access to these flues, which of course must be kept clean. These grates are very compact and the oven flues are only about 2 in. wide so that regular and thorough cleaning is essential. The main chimney flue must also be kept well swept.

The type with the oven over the fire grate has oven flue openings at the head of the fire on each side. When a back boiler is fitted for water heating there is also a flue passing under and behind the boiler. Two dampers are provided controlling

oven and boiler heating respectively. Usually the oven interior is removable to give access to the main chimney flue for sweeping.

A combination grate is intended to combine three functions: cooking, heating hot water for bath, lavatory basin and sink, and room warming. As they are compact and the appearance is quite good they are suitable for installation in kitchen or living room.

There are many patterns, small and large. For the small house and small family the oven-over-fire type is suitable. For the average family the oven-at-side, with or without a hot closet above, is the best. And for the large family the double-oven with the fire grate in the middle and hot closets above is adequate.

The arrangement for allowing kettle and saucepans to be placed for boiling is not satisfactory in all types. This does not matter if a gas or electric stove is available for boiling, but if the combination grate must be used for this purpose care should be taken to select a suitable type. There are two arrangements: one consists of a portable or hinged trivet in front of the grate—this is not very good as the side of the saucepan is in contact with the fire: the other consists of a lifting or hinged grid which swings over the fire—this is better as the heat is then under the saucepan.

The combination grate is a good replacement type where the existing grate is of the old-fashioned kitchener type. The job of replacement is not beyond a skilful handiman. The makers supply fixing instructions with detailed drawings and if these are carefully followed there should be no great difficulty in fixing.

A grate must be selected which will fit into the existing fireplace, but old fireplaces are usually of generous dimensions. It does not matter if the new grate is smaller than the old as the sides and back can be built up with new brickwork.

To remove the old range all visible screws must first be taken out—using thin oil to lubricate them if they are stiff. A screw-driver bit used with a brace is better for moving stiff screws than an ordinary screwdriver. If the grate is tightly wedged in the fireplace it may be necessary to cut away some of the brickwork.

The new combination grate will be delivered in sections and

the makers instructions should be followed in assembling. The lower part is fixed first, but the brickwork filling at back and sides should be built up before placing the oven and grate portions in position. Although ordinary bricks and cement mortar can be used for this purpose it is better to use fireclay bricks and a fire-resisting cement.

If the fireplace is very old the flues may be large, and a flue larger than $13\frac{1}{2}$ in. square is likely to cause down-draught. A size of 9 in. $\times$ 9 in. is best. A large flue should have the opening immediately over the fireplace restricted by corbelling out brickwork from the sides or back to reduce the opening to 9 in. $\times$ 9 in.

Fixing circulating pipes for the hot water system and connecting them to the boiler is beyond the ability of most handymen and a plumber should be employed to do this. It is very important to make good the holes in the brickwork around these pipe connections. If this is not done smoke and heat will escape.

Surrounds and mantelpieces are separate items. For a working kitchen a plain cast-iron mantelpiece is suitable. For a living room a tiled surround is preferable, and if the fireplace is a wide one it is better to have a surround which will completely cover the old brickwork. Any bare brickwork showing after the grate is fixed must, of course, be plastered.

Heat storage cookers

The grates and ovens of this type are surrounded by thick cast iron which stores the heat and also distributes it evenly. In the best types temperatures are thermostatically controlled. These cookers are more costly than combination grates but they are undoubtedly superior, and although the initial cost is greater the running costs are considerably less. The "Aga" Model C has a guaranteed fuel consumption of less than two tons a year. It has a top oven for roasting and baking and a lower oven for simmering. The draught is automatically controlled by a thermostat.

These cookers are self-contained or independent so that they do not need an enclosed fireplace. The exterior is enamelled and very easily cleaned.

Back-to-back grates

This type of grate serves two purposes in two rooms. It is fixed in a fireplace opening on a wall which has the kitchen on one side and the living room on the other. One side of the back-to-back grate is a kitchen range with an oven and boiling plate. The other side has the appearance of an ordinary living-room grate. The fire on the living-room side heats the living-room and also the oven on the opposite side. There is a boiler for hot water supply on the living-room side. Fig. 4 shows a section.

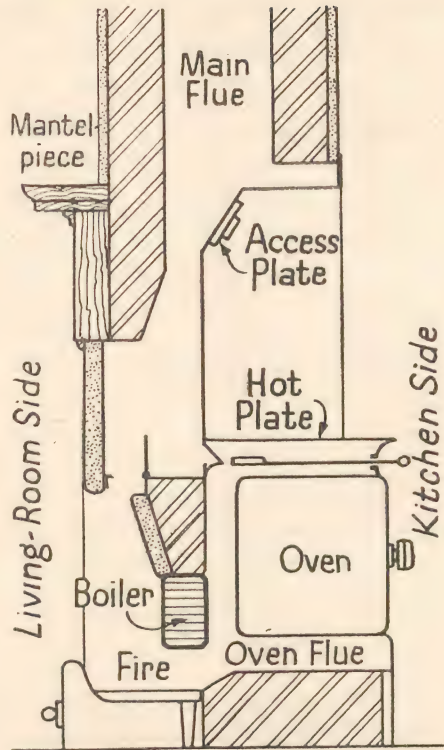


FIG. 4. SECTION THROUGH A BACK-TO-BACK GRATE, WITH FIRE ONE SIDE AND OVEN THE OTHER

This type of grate is obviously economical, both in first cost and running cost. It also enables one fireplace and chimney flue to serve instead of two. It can, of course, only be installed where the house plan is suitable.

LINOLEUM AND RUBBER FLOORING

These materials are deservedly popular for floor coverings because they are durable, decorative and easy to lay. At least they are easy to lay if you know how; but what an ugly mess many people make of the job! There are two essentials: the floor surface must be smooth and dry, and the material must be cut and laid to an exact fit.

Linoleum

There are two materials which should not be confused. One is linoleum flooring and the other cellulose flooring. The

“body” of the material in both consists of corkdust, sawdust and colouring matter, but linoleum has a “base” of oxidized linseed oil and gum resin, while cellulose flooring has a base of gelatinized nitrocellulose. These materials are prepared in paste form and spread on a backing of fabric.

Linoleum is thicker than cellulose flooring, though the latter is harder. In a warm room the cellulose material gives off a very small amount of gas which you can smell, though this decreases in time, and it is more readily affected by heat and steam than is linoleum.

Sizes of Linoleum

The standard width is 6 ft. and the material is made in rolls 30 ft. long. Thicknesses are made from $\frac{1}{8}$ in. to $\frac{1}{4}$ in.

Cellulose flooring is made in three thicknesses: $\frac{3}{8}$ in., $\frac{1}{8}$ in. and $\frac{1}{4}$ in., the standard width is 6 ft. 6 in. and lengths up to 100 ft. are produced.

Laying linoleum

Few people know that the proper way to lay linoleum is to cement it down to the floor with a special mastic. It can, of course, be successfully laid on a wood floor without cementing, but cementing is the only satisfactory method on a hard floor, such as concrete or tiles.

To lay without cement on a wood floor, first punch down any nail heads which may be standing above the surface. Probably the floorboards are warped so that the edges stand up a little. These edges should be planed down, using a smoothing plane. If they are left the linoleum will be marked and in time will wear badly over the edges. The appearance will be very much better if the linoleum is laid on a smooth level surface.

The floor should be measured so that the best way of laying the material can be decided, bearing in mind that the width of linoleum is 6 ft. and of cellulose floorings 6 ft. 6 in. It is usually best to lay in the direction of the room length so that cutting is reduced to a minimum.

Start by laying against a straight wall, so that only the length has to be cut off. Make sure that you start with the first end square and tight against the skirting. To mark off the line for

cutting at the opposite end proceed as shown in Fig. 5. You have the surplus material rolled; flatten it to within about a foot of the skirting and then mark it. From this mark take an exact measurement to the skirting. Pull the linoleum back so that you can set out this dimension from the mark. Draw a line in chalk, using a straight-edge, and cut off.

To cut out for fitting round a hearth or into a bay window proceed as follows: First cut off the correct length, as just described. Lay this opposite the fireplace or bay so that its ends touch the skirting. Then with a straight-edge or square mark lines opposite chimney breasts, hearth, bay opening, etc., taking great care to obtain accuracy. The depth of the cuts can be obtained by measuring. When you have set out the lines and checked it over you can cut the shapes. As an additional precaution you can cut a templet of brown paper.

The last length to be laid will probably have to be reduced in width. Cut the side against the wall. Take careful measurements from the edge of the last full-width piece to the skirting. One measurement will not be enough, as the skirting may not be quite parallel with the linoleum. Set out the dimensions on the length of material, which should previously have been cut to the correct length so that it can be laid flat, and then cut off the surplus width.

Use a strong sharp knife. A table or kitchen knife is unsuitable for this job as it is not strong enough. A large claspknife

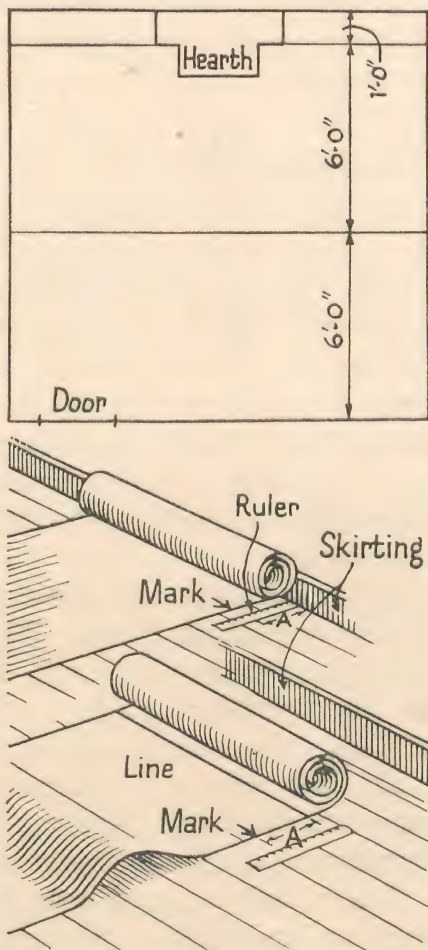


FIG. 5. FITTING LINOLEUM

The bottom diagram shows how to cut off the end accurately

blade, well sharpened, is suitable. Most people cut irregular lines because they do not use a suitable knife and do not take care—they are in too much of a hurry. You may find it best to make a marking cut along a straight-edge as a preliminary to complete cutting. Keep the linoleum flat on the floor while you cut.

In laying see that the abutting edges make close contact. They may be secured to a wood floor with shoe tacks spaced at intervals of about 2 in.

Guarding against rot

Laying linoleum tight up to the skirtings prevents air reaching the surface of the floorboards and is thought by some to encourage dry rot. In my opinion there is no danger provided the space under the floor is well ventilated through air bricks and that the room is used so that it has ordinary heating and ventilation. I have seen a wood floor which had been completely covered with linoleum for eleven years and there was no sign of rot or discoloration when the linoleum was taken up. But as a precaution the floorboards could be treated with an odourless preservative.

If the room is not much used and rarely heated the atmosphere will be periodically damp. The door and windows should be kept open in damp weather. An underlay of thin bituminous felt (the type that has a dry surface, the bitumen being covered) will help to prevent rot, both in floor and linoleum.

Linoleum laid on a concrete or other solid floor should be cemented down with the special mastic supplied by the makers. But this is a job for an expert layer.

If it is not cemented down condensation or “sweating” will occur on the interface, and in time this will rot the linoleum. An underlay of bituminous felt will retard this, and if the room is well ventilated and heated the linoleum will last for many years. But it is worth the extra cost to have it cemented down.

Laying rubber

Rubber should be cemented down, even on a wood floor, and this too is a job for the expert. But it is satisfactory to lay it without cementing on boards, using the methods already described for linoleum.

Rubber can be cut fairly easily with a strong sharp knife, and it helps if the knife is dipped in very hot water before each cutting operation.

If you have rubber cemented down make sure that the floor surface is absolutely dry. Any damp rising from the ground will affect the adhesive and curling will follow.

The floor surface must be smooth. Punch down nail heads and plane warped edges. If there are wide gaps in the board joints fill them with plastic wood and sand-paper the surface. If the boards are in poor condition a good surface can be provided by covering with plywood, secured with panel pins. A cheap whitewood plywood $\frac{1}{4}$ in. thick is suitable.

The trouble taken in preparing the floor surface will be repaid, both with rubber and linoleum, by the smooth regular surface of the flooring and the absence of local wear.

CARPET LAYING AND CARE

The proper laying and care of carpets will enable them to stand many years of use. If you lay a carpet on a rough floor surface and clean it by brushing and an occasional beating, let people walk on it with muddy boots and the dog make a bed of it, you must not complain if in a few years it begins to look thin and finally wears away in patches.

Importance of even wear

If a carpet has to stand hard use in a few places while the rest of it has little wear it will obviously wear out in patches and will be spoilt, although the greater part of its area is still good.

This brings up a strong point against the "fitted" carpet, fitted tight up to the skirtings, which cannot be turned about and will have to endure hard use near doorways. True, a fitted carpet of good quality in a room which is not in continual use will last many years if well cared for. But if long life is desired it is not advisable to have a fitted carpet in the chief living room.

An uneven floor will cause a carpet to wear quickly in patches. The ridges formed at the edges of warped floorboards are especially bad in this respect. The ridges are repeated in the carpet, and as you walk over it your feet are supported mainly on

the ridges, so that they receive most of the wear and the material between hardly any. Upstanding nail heads will rapidly penetrate a carpet. Loose knots, open joints and rough boards will also cause local wear.

So before laying a carpet inspect the boards, punch down up-standing nail heads, plane warped edges, cut out loose knots and prepare wood plugs and glue them in, smoothing the surface with sand-paper, fill wide joints with plastic wood and sand-paper them smooth, and if there are any rough or decayed boards take them up and replace with new. If the boarding is very worn and rough it will pay to cover it with plywood secured with panel pins. If you are having a fitted carpet an ordinary whitewood plywood $\frac{1}{4}$ in. thick will be suitable. For carpet squares and runners the whole floor should be covered with a hardwood faced plywood. Special flooring squares of plywood are made for this purpose. For a large carpet square which leaves an exposed margin you could have hardwood for the margins and whitewood for the covered area.

A felt underlay is always an advantage, and if there is any un-corrected unevenness in the floor it is a necessity as it does partly even-up the surface. But an underlay will not completely mask a rough floor. The "feel" of a carpet, especially if it is a thin one, is greatly improved by an underlay. It is desirable that the underlay should be about 1 in. shorter each way than the carpet. This will ensure that it is completely hidden and will also "chamfer" the edges so that the carpet is not so easily kicked up and does not receive unduly hard treatment along the edges.

If carpets or rugs are laid on concrete or tiled floors they will absorb moisture in damp weather, unless the room is continually heated, owing to the cold and practically impervious surface of the floor causing "sweating." A layer of thin bituminous felt or bitumen paper of the kind that has the bitumen sandwich between fibre layers will protect the carpet from the damp, though it is still advisable to have a hair felt underlay between the carpet and the bituminous sheets. But unless the room is properly heated in damp weather there will still be moisture on the hard floor surface.

Fitted carpets

The leading furnishing firms have expert workmen who can

fit carpets much better than the handyman can expect to do.

Two methods are in use: to use material of considerable width, which is an advantage for large floors as it reduces the amount of joining; and to use narrow width material, which is an advantage in rooms of irregular shape as it reduces cutting and waste.

Under normal market conditions it is possible to buy plain carpet in good lengths up to 9 ft. wide, and if a similar colour can also be obtained in widths of 3 ft. or less this can be used with the wide material to make up the width of the room. The narrow material can be cut where necessary to make up the width.

The separate widths of carpet should be stitched together using strong thread. If drawn closely together the seam will not show except to close inspection.

The outer edges should be bound in wool of a similar colour to the carpet. Corners should be rounded.

For cutting to size the hints already given on cutting linoleum should be followed, though a pair of tailor's scissors will be much better than a knife. Use chalk for setting out and draw the lines along a straight-edge. Check all dimensions. Mistakes are easily made, especially if you rush the job.

Carpet squares and rugs

The remarks already made about the floor surface apply equally to squares as to fitted carpets. Carpet squares and rugs look well on a polished hardwood floor, though ordinary deal boards can be varnish-stained.

Small squares and rugs are easily disturbed, and if they are laid on a fitted carpet tend to ruckle up. Pieces of lead stitched to the corners underneath or strips of thick rubber help to reduce this tendency.

Fitting stair carpet

Most stair carpet is 18 in. wide and so leaves a margin on each side, which must be painted, stained or grained. The stairs will look much better if you fit a wider carpet, 2 ft., or on a very wide staircase more, reducing the margin to about 1 in.

Brass stair rods are not now much used as they tend to harbour dust and to interrupt the pattern of the carpet. End clips are now widely used. If rods are used oak rods of triangular section are preferable to the old type brass rods.

On landings carpet with pattern margins should be mitred and stitched together. A plain pattern carpet may have straight joints, but these should be stitched and the cut ends bound. Landing carpet should be tacked along the edges, using broad-headed carpet tacks.

Winding steps are difficult to cover satisfactorily. It is advisable to choose a plain all-over colour without margin or large pattern. Then, where the carpet is turned up the riser, cut it off just under the nosing of the step. The piece laid on the step above is then turned over the nosing and tacked after lapping it over the piece below. Thus there is one piece for each tread and riser. You can make a paper pattern from which to cut the pieces.

Care of Carpets

The importance of an even floor surface in preventing local wear has already been stressed. A carpet square should, of course, be turned about periodically so that it is not worn more in one part than another.

Stair carpet tends to wear at the tread nosings, and it will last much longer if you move it up or down an inch every year. To do this turn up a length of about 6 in. against the lower or top stair when fixing it first. This gives you six moves at one inch a move, and after that it can be moved in the reverse direction.

A carpet should be cleaned every day if possible, and the electric vacuum cleaner is the best equipment for the job. It sucks out the dust and does not wear the carpet. A hand-driven carpet sweeper has a revolving brush which, with the wheels, is bound to wear the material. Nor does it clean so thoroughly as the electric vacuum type.

For the spring cleaning the carpet should be taken up. Some dust will have gathered under the edges and this should be brushed away. Treat it twice with carpet soap and warm water (there are several good brands of carpet soap). As soon as the water becomes dirty throw it away and get fresh. The water should be lukewarm only. Hang the carpet over a line to dry.

Before replacing the carpet sweep and wash the floor, and let it dry. The underlay should be shaken in the open air. It is necessary to keep the floor and underside of the carpet clean or dust will accumulate and gradually work into the carpet. Any under-carpet moisture will convert it into mud, and this in turn will hold more moisture. An even more important point is that moths lay their eggs at the edges of carpets. The problem of moths attacking carpets (or, rather, their grubs, is dealt with on p. 343).

Stains

Proprietary stain removers are sold by chemists. But carpet soap will remove ink and most other stains. Grease stains are the most difficult to remove. One method is to apply a hot iron over thick blotting paper. Any grease still left after repeating the hot-iron treatment several times can usually be removed by rubbing with a clean rag soaked in petrol or methylated spirit.

FLOOR AND WALL TILING

Floor and wall tiling is not too difficult for the handyman to undertake provided he tackles the job in the proper way. It is advisable to start with a small job, such as laying quarry tiles on a w.c. floor. This little experience will be valuable in showing up the snags and the best way to deal with them.

Floor Tiling

Floor tiles are of three main types: Quarry tiles which are clay tiles made in red, russet, buff and blue colours and widely used for paving kitchens and sculleries. Common sizes are: 6 in. by 6 in. by $\frac{5}{8}$ in. and $\frac{7}{8}$ in., 9 in. by 9 in. by $1\frac{1}{4}$ in., and 12 in. by 12 in. by 2 in. They can be laid to break joint or in a pattern of regular squares—the latter looking the neatest. The 6-in. by 6-in. size is best for kitchen and other small floors.

Encaustic and other tiles are made in white, black and several colours. They are smaller and thinner than quarry tiles and the clay from which they are made is finer. They are used in halls and porches and are usually laid with a border of different colour to the main area. Chequer and other patterns can be designed in different colours and sizes.

Terazzo and other tiles made with a cement mix are very good, and those made with marble are highly decorative and hard wearing. A white or coloured cement is often used, sometimes in a contrasting colour to the aggregate. The surface is polished.

Laying

Tiles must be laid on a firm concrete bed. They are bedded one by one on cement mortar and lightly tapped to level them. If the concrete sub-floor is rough it should first be screeded with $\frac{3}{4}$ in. of cement mortar. To do this wood battens of the screed

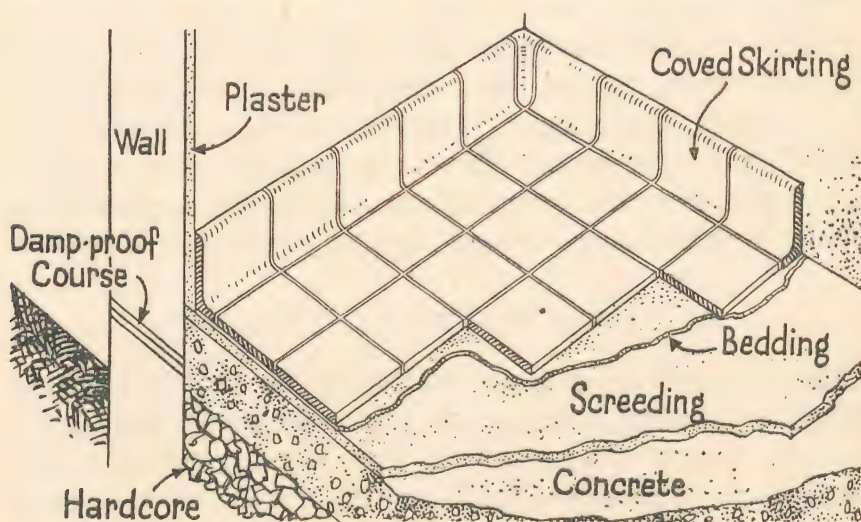


FIG. 6. QUARRY TILING ON CONCRETE FLOOR

thickness are secured on the concrete with dabs of mortar. The screeding mortar is then spread between them and a screed board worked over the surface, its ends moving over the screed battens so that it is levelled and smoothed. There must, of course, be sufficient depth from floor level to concrete if screeding is to be adopted. The wood screeds should be removed and the space made good with mortar. Fig. 6 illustrates details.

In laying new tiles on an old floor, the old flooring or paving must be taken up. A bricklayer's hammer should be used for this job and a bricklayer's chisel and club hammer for breaking up the old cement bedding. This is a tough job on a large floor, unless the old bedding material is of poor quality, but it must be done unless the new tiles are to stand above the level of the old. As it is there will be no spare thickness for screeding.

The bedding mortar should consist of 1 part Portland cement to 2 parts clean sand, by volume, thoroughly mixed dry and then mixed wet while adding water through a rose. The mortar should be rather stiff but easily workable.

Before laying the tiles, brush the concrete or screeding to remove all dust and then wet it by sprinkling water over it. The tiles should be soaked for a few minutes and then stood on end for one minute to allow superfluous water to run off.

Place the mortar on the concrete or screeding, using a brick-layer's trowel, and spread it slightly. Press the tile on to the bedding and tap it lightly to bring it level. A straight-edge and spirit-level should be used to check the surface as the work proceeds.

The side joints may be very thin, in which case merely wipe the edges on the mortar and press them close together. Or they may be wide, and a $\frac{1}{4}$ -in. joint is favoured in modern work. This has an excellent appearance especially when the tiles are laid in square pattern. Mortar should be wiped on to the edge of the tile with the trowel and the tile then gently pressed against those just laid. Use a piece of wood $\frac{1}{4}$ in. thick to check the thickness of joint.

Good adherence between the tiles and mortar bedding is obviously important, as also between the bedding and supporting concrete or screed. Quick drying out should be avoided, otherwise the water in the bedding will be rapidly soaked up by the dry tiles and the mortar will shrink and develop fine cracks. Poor adherence may result in tiles working loose. To retard the drying out cover the floor with damp sawdust, sacking or brown paper and keep it damp for at least five days. During this period the floor should not be used.

It is an advantage to have a tiled skirting. While ordinary tiles with square edges can be used for this purpose, it is better to use special skirting tiles with a rounded top edge and a cove at the bottom, as shown in Fig. 6. If the wall is to be covered with glazed tiles the skirting may be included in the wall tiling, glazed skirting tiles with cove being available. A coved skirting is hygienic and easy to clean as there is no gap for dust and dirt. A wood skirting shrinks a little and opens a gap.

To secure maximum adherence of floor tiles the method recommended by the Building Research Station may be followed.

Twenty-four hours before laying the tiles, soak them and then brush on to the lower face a cement grout. This grout is made by mixing cement with water to a creamy consistency. When the tiles are laid twenty-four hours later the grout will not be hard and will bond itself to the mortar bedding.

The usual type of quarry tiling on kitchen and other floors is the red tile laid with tight or thin joints. The appearance will be much better, however, if a russet-brown colour is adopted

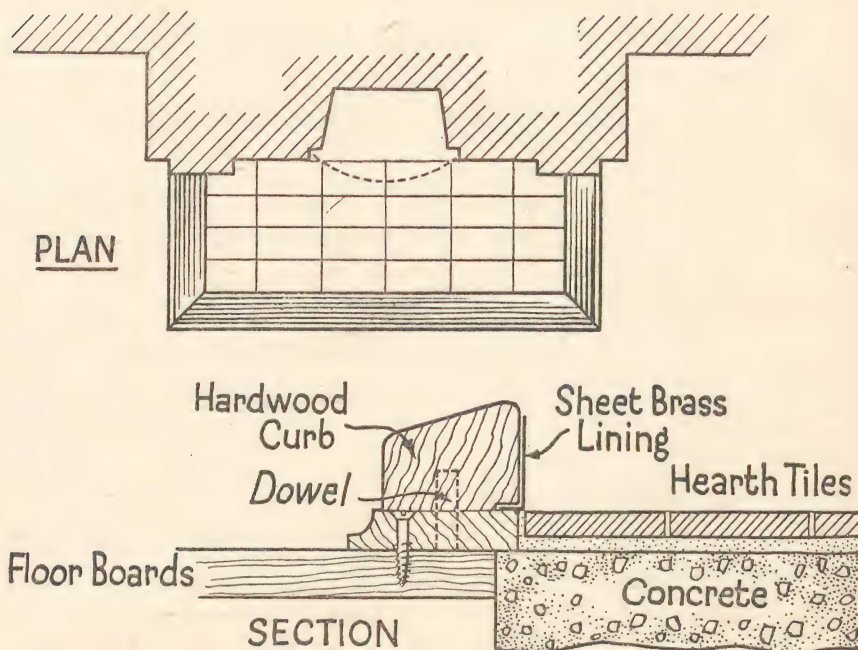


FIG. 7. HOW TO MAKE A RAISED TILED HEARTH WITH A FIXED CURB

and the tiles laid with $\frac{1}{4}$ -in. side joints. A further improvement is gained if a yellow ochre pigment is added to the jointing mortar (or you can buy a tinted cement).

On a large floor a border of tiles of different colour will enhance the appearance, but it is better not to have multi-coloured patterns with quarry tile floors.

For tessellated and other thin tiles a chequer pattern of black and white or russet and buff looks better than any elaborate pattern.

Hearth tiling

Glazed tiles are made for this purpose. Only the best quality should be used as an inferior glaze will be cracked by the heat.

When replacing an old tiled hearth it is advisable to have the new surface raised above floor level, provided that a fixed tiled, faience or hardwood curb is used. The curb should be set in position (this is bought ready-made in one piece), and the hearth tiles can then be laid tight up to the curb. With a raised hearth it is sufficient to remove the old tiles. The old bedding can remain, though any loose or cracked material should be hacked up. A mortar screeding can be added to ensure the new tiles being laid to the required level. Fig. 7 illustrates details.

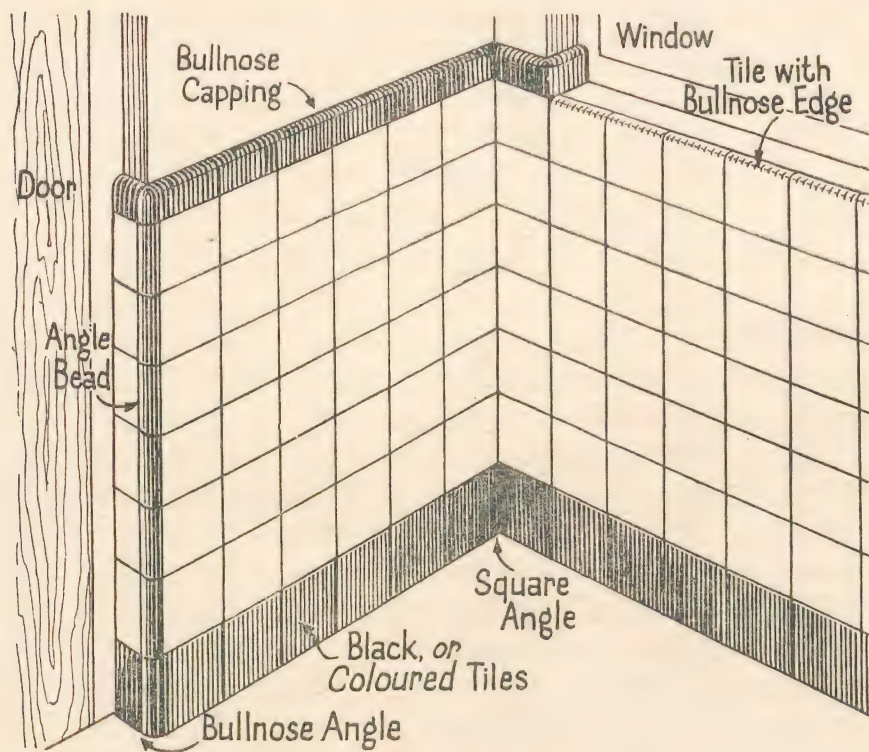


FIG. 8. GLAZED WALL TILING

Wall Tiling

Wall tiling, like floor tiling, is not beyond the ability of a good handyman, but initial experience should be gained on a small job. Even then you cannot expect to do such good work as the experienced craftsman, though if you take every care and work slowly you should make a creditable job.

Wall tiles are made of fine clay surfaced on the outside with a glaze, which may be white, black or coloured. There is a range of sizes from 3 in. by 3 in. to 9 in. by 6 in. with narrow

tiles for bands and panel lines. In present-day work the 6 in. by 6-in. size fixed to a square pattern, as shown in Fig. 8, is generally favoured.

It pays to buy the best quality British tiles; the glaze of inferior foreign tiles will soon craze.

The supporting surface

If wall tiles are to "stay put" the supporting surface must be firm and free from any appreciable swelling, expansion, contraction or warping. Ordinary brick, stone or concrete walls are firm enough, but some partitions are not. Thin block partitions sometimes give trouble, especially if supported on the wood floor without a special beam support. Breeze concrete sometimes causes trouble by swelling and cracking. Examine the wall or partition first and if there are many cracks you must be prepared to take a risk if you decide to cover with tiles.

Screeding

The wall or partition should be screeded with $\frac{3}{8}$ to $\frac{1}{2}$ in. of cement and sand mix (proportions 1 to 3) to provide a firm ground. This is done by nailing laths or battens of wood to the wall at a spacing of about 4 ft. Apply the screeding material with a float (you can make a float out of a flat piece of board about 9 in. by 4 in. by $\frac{1}{2}$ in. with a wooden bow handle on the back). As you place it on the wall spread it with a firm semi-circular movement. Then take a straight-edge and work it over the screeds to bring the screeding to a smooth even surface. It should not, however, be too smooth or it will not provide a good key for the tile "buttering" mortar. Remove the wood screeds and make good the space with the mortar.

The screeding material will only adhere to the wall if there is a good key on the wall face. If the bricks or blocks are smooth rake the joints out to a depth of $\frac{1}{2}$ in.

In tiling an old wall which has been plastered, it will probably be found that beneath the surface the old plaster is very soft—little better than sand. This must be removed as it is not strong enough to support the tiles. But if the plaster surface is hard you can apply the tiles directly to it. Though if it is smooth you should scratch it to provide a key. Drive a few

small nails through a piece of wood until the nails protrude and use this simple tool for scratching.

Fixing wall tiles

The backs of the tiles are "buttered" with cement mortar and then pressed on to the face of the screeded wall. The buttering mortar should be fairly strong (1 part of cement to $2\frac{1}{2}$ parts of clean sand), thoroughly mixed to a rather stiff consistency. If it is too thin it will tend to run off the back of the tile and the tile itself will tend to slip. Hold the tile horizontal and apply the mortar to the back with a trowel, spreading it fairly even to a thickness of $\frac{1}{4}$ in. or little more. Then press the tile gently but firmly on to the wall, giving it a few taps with the trowel handle to bring the face truly vertical.

Before commencing fixing, the tiles should be soaked in water for two minutes and then allowed to stand for one minute to allow water to drain off. The screeding face should be well sprinkled with water. This, as already explained for floor tiling, is necessary to prevent the water in the fixing mortar from being rapidly absorbed into dry materials.

The usual practice in wall tiling is not to place any mortar in the side joints, but to press the tiles closely together. It is, however, a better practice to leave a jointing space of about $\frac{1}{8}$ in., afterwards pointing the joints with Keene's cement or a similar white hard-setting cement.

Special tiles

If you get a catalogue of glazed tiles from a tile manufacturer or a builders' merchant you will see that a large number of "specials" are included. There are narrow tiles for forming bands in different colours, bullnosed capping tiles with rounded upper edges, rounded angle tiles for internal and external angles, and coved skirting tiles.

Generally the plain tiles are for the flat areas of walling. For corners and junctions it is better to use the appropriate special tile. If, for example, the tiling is to form a dado only, finishing about half-way between floor and picture rail, capping tiles should be used for the top course. The top edge of these tiles

is bent and curved so that it forms a rounded finish. Plain tiles can be used in the internal corners but curved internal angle tiles look better and are easier to clean. Similarly, plain tiles can be used for skirtings, but it is better to use the special coved skirting tiles.

In small rooms one colour is best, and it should either be white

or a light tone. But black or a deep colour can be used for the skirting tiles with a narrow band of black or coloured tiles immediately under the top course.

It is advisable to carry the tiling a course or two above the window sill level, and the sills should be tiled, using a rounded edge tile. Some of the special tiles are illustrated in Fig. 9.

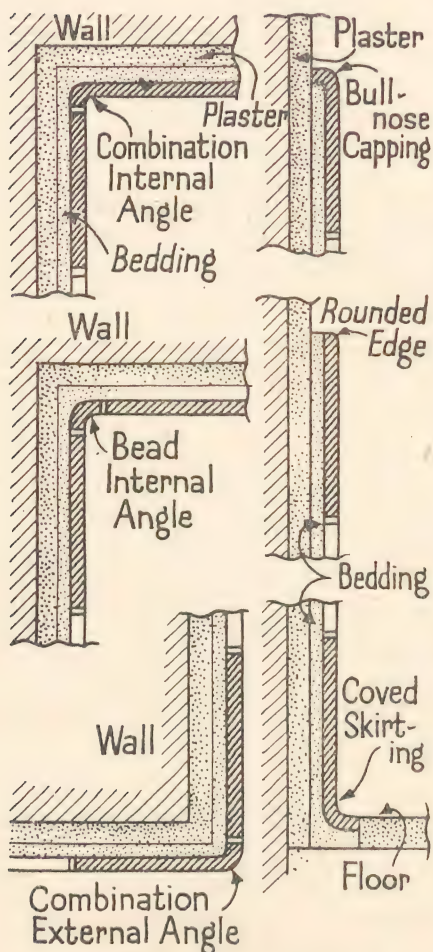


FIG. 9. DETAILS OF GLAZED WALL TILING SHOWING SPECIAL TILES

Loose tiles

The backs of glazed tiles are plain clay, rather too smooth to give a good key for the buttering mortar. Generally they are grooved which slightly assists adherence. But you may find one or two tiles work loose, especially if the tiles or screeding were not well wetted immediately before fixing.

When re-fixing loose tiles first cut away the old buttering mortar (assuming it has adhered to the wall. If it has adhered to the tile you may be able to chip it off without damaging the tile—if not a new tile must be used).

Adherence is greatly assisted if the back of the tiles are coated with cement slurry (as already described for floor tiling) twenty-four hours before fixing.

Tiling on wood partitions

Wood studded partitions can be tiled if the framing is reasonably stiff. Any movement will, of course, crack the screeding and jointing.

Expanded metal lathing should be stapled to the wood framing and the cement and sand screeding applied to this. If the partition is an existing plastered one with wood lathing, it is better to strip it and screed on expanded metal.

VERMIN—PREVENTION AND DISINFESTATION

Vermin of one kind or another may infest any house, even a new one, and the householder often tolerates the nuisance because he does not know how to deal with it. Stern measures should be taken with all vermin. Rats, mice and many insects are a danger to health as they feed on decayed and germ-infected matter. Moths cause a lot of damage to fabrics—or, rather, their grubs do. All vermin are, of course, unpleasant to have in the house, including flies and ants.

The importance of cleanliness

The best preventive is cleanliness. This means more than ordinary dusting, sweeping and floor washing. Insects lay their eggs in narrow crevices and feed on decayed matter which in the form of small crumbs and dust lodges in such crevices.

Any house, even a new one, abounds in crevices and small spaces which are inaccessible to ordinary cleaning. Narrow gaps open between woodwork owing to the shrinkage of the wood. Such gaps are common between floorboards, skirtings and floors, and at the back of baths and built-in fittings. In an old house there are, of course, many such crevices and gaps.

At least once a year all these places, which cannot be reached by everyday cleaning, should be cleaned up. You can easily improvise small cleaning instruments. Narrow pieces of stick or thick wire can be used to scrape out the narrowest gaps. Small brushes and pieces of rag tied to sticks can be used to clean under and behind baths and other fittings.

Those parts which can be reached should be washed out with

soapy water to which a little ammonia or soda should be added. Those which cannot be washed should be sprayed with a suitable insecticide, preferably one containing D.D.T. If not washed off a D.D.T. insecticide will remain effective in destroying insects for two or three months.

Rats and Mice

Under the Rats and Mice Destruction Act, 1919, occupiers of property are required to take whatever steps are reasonably practicable for the destruction of these vermin, and there is a penalty for failure to do so.

If you have reason for believing that rats and mice are breeding on adjoining property you should approach the occupier, and if he fails to take steps to disinfest the property you should approach the local authority (the Sanitary Inspector).

If your own property is infested you can tackle the problem on the lines suggested here, but if it proves beyond you then approach the local authority. They will probably have a skilled ratcatcher who will do the job for a moderate fee.

There are two kinds of rat common in Britain: the brown rat, which is the most common; and the black rat, which is not very common and is not so pugnacious as the brown rat.

Rats breed very quickly. After allowing for mortality and unfavourable circumstances it is estimated that the progeny of a pair of rats will be at least 130 a year, and under favourable conditions much more.

There are three things which rats and mice must have: food, drink and shelter. So both in prevention and disinfestation the first step is to cut off the food and drink supply as far as possible, and the second to seal off all spaces which can afford shelter.

It is not difficult to place food beyond the reach of rats. The common brown rat is not a good climber, so if food is placed high up in cupboards he is not likely to reach it.

But rats feed on edible refuse so it is essential to place all such refuse in a closed bin, unless it can be burnt at once. The importance of cleanliness has already been stressed. If scraps of food are left about they get broken up into small particles which are blown or swept into crevices. Rats (and mice) will be attracted by these small crumbs.

Structural measures

Rats and mice easily eat through wood, especially thin boards. Cement concrete and sheet metal will stop them, as also will brickwork or masonry laid in cement mortar without gaps. Obviously solid concrete floors provide no shelter, but the space under wood floors does. Where the brown rat is concerned this only matters on the ground floor.

Rats can eat through the bottom of a door, but this can be made rat-proof by covering with sheet metal, as shown in Fig. 10. Steel, copper or zinc can be used.

It is not suggested that hollow wood floors should be taken up and replaced with solid concrete, but the structure should be examined, and if there are any gaps through which rats can penetrate from outside they should be stopped with cement mortar.

As mice can penetrate small gaps, attention should also be given to these.

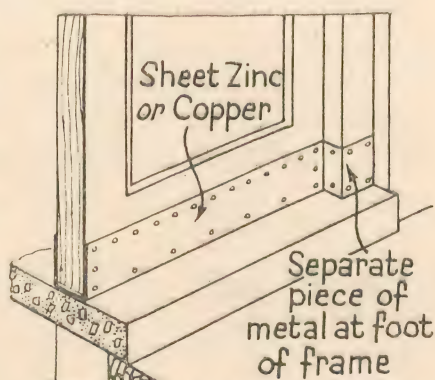
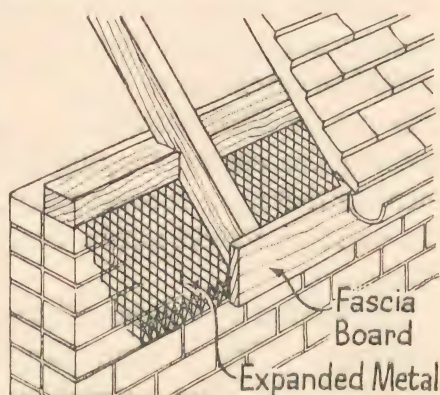


FIG. 10. HOW TO MAKE RAT-PROOF
Top: Roof eaves
Bottom: Foot of wood door

Rat destruction

The methods of destruction are: trapping, poisoning with baits, poisoning by fumigation.

Traps should not be relied upon alone, although one or two are useful. Rats are intelligent and wary and will get to know the traps in time.

Poisoned baits are the most effective instruments of rat destruction. Proprietary poisons are made containing arsenic quills, barium carbonate or phosphorus. They should be handled with great care and unconsumed baits should be taken up.

It is better to place the baits in some kind of container than

to leave them in the open. Small drainpipes make excellent containers. Start by placing unpoisoned baits for a few days. The rats will thus form a habit of taking the baits. Follow up with poisoned baits. Burn or bury the dead rats.

If rats die in an inaccessible position spray the place with a deodorizer of chloride of zinc mixed with a little pinewood oil.

Fumigation is an effective method but is not suitable for occupied houses. It can be used in outbuildings, though an expert should be employed to handle the job. If the rat runs are visible they can be filled with the gases from the exhaust pipe of a car, keeping the engine running for about half an hour. But remember that these exhaust gases are dangerous to human life, and the building should not be entered until it has been thoroughly ventilated.

Fumigation by sulphur dioxide can be carried out in isolated buildings. This is quite simple, the gas being generated by burning sulphur on a metal tray. Methylated spirit should be used to ignite the sulphur. About 3 lb. of sulphur for every 1,000 cu. ft. of enclosed space should be used and the fumigation continued for 6 hours. While doors and windows should be closed and fireplaces sealed some air supply is necessary for the combustion of the sulphur. Rats often follow the pure air currents leading to the sulphur and die near the spot where it is burning. The building should, of course, be thoroughly ventilated before occupation.

It should be realized that if the rats breed in a place outside the fumigated building they will probably retreat via the runs. Fumigation will then only be effective if the gas is forced into the runs with a bellows apparatus. But the method of connecting a motor-car exhaust pipe to gas the runs, as already described, will destroy the rats in their retreats.

Insects

The vermin under this heading include all vermin other than rats and mice. Under the Public Health Act, 1936, the owner or occupier of premises is required to disinfest any building used for human habitation on a certificate to this effect being issued by the sanitary inspector or the medical officer of health. If the certificate is not complied with the local authority may have

the work done and recover the cost from the owner or occupier, except that if the local authority decides that fumigation is necessary they must themselves have this done and pay the cost.

Any person found to be in a verminous condition may be compulsorily cleansed by order of the local authority, whether the person be willing or not.

Regarding fumigation, this treatment must be carried out by a specialist. The fumigant usually adopted is hydrogen cyanide, which is very poisonous, and its use for this purpose is controlled by the Hydrogen Cyanide (Fumigation of Buildings) Regulations, 1938, made under the Hydrogen Cyanide (Fumigation) Act, 1937.

Insecticides

Insecticides other than gases are either vapour forming compounds or contact agents, or a combination of both. The gas sulphur dioxide, already described as a fumigant for use against rats, can also be used to disinfest premises of insects, including bugs. But for private use gas treatment is neither safe nor convenient.

There are many insecticides, some of them "ordinary chemicals." But for general use those proprietary insecticides containing D.D.T. are best. D.D.T. does not itself kill instantly, but it paralyses the insects within a short time. It is not poisonous to human beings or animals, but it will kill bees. Food should be removed before spraying. In conjunction with other insecticides it is very effective, having a vaporizing action which penetrates the smallest cracks and crevices, and when deposited on any surface it will kill any insect making contact with it, remaining effective in this way for about two months provided it is not washed off.

Some insecticides of this type have proved so effective when properly applied by trained operators that they are now widely used by local authorities instead of the fumigation treatment.

Disinfestation by spray treatment, whatever insecticide is used, must be thorough to be effective. Although any insecticide containing D.D.T. will kill flies if sprayed in the air only, this treatment would not be effective against bugs, since bugs are harboured in small crevices and holes and rarely come into the open until it is dark.

To get rid of bugs, cockroaches, ants, silver fish and all insects harboured in cracks and holes it is necessary to spray the harbouring places and their immediate environment. For this purpose a narrow jet is much better than a wide spray, as the jet will enter small holes and spaces.

The work should be done systematically, starting with door frames and doors, then going on to skirtings and picture rails, floorboard joints, cracks in plaster and the back of peeling wall-paper. In bad cases all wall, ceiling and floor surfaces should also be sprayed.

In many cases it will be necessary to treat the furniture too. Bugs and moths are readily harboured in furniture, particularly upholstered furniture. If woodworms are present either in furniture or doors, floors, etc., the holes made by the grubs will form a harbourage for bugs, and other insects, and these should be well sprayed. In fact any hole, small space or crack should be treated.

The blow-lamp is an effective instrument in the treatment of suitable materials—brick, plaster and concrete, as the flame instantly destroys both insects and eggs.

In very bad cases it will be necessary to strip old wall-paper, skirtings, picture rails and other mouldings, and to treat the stripped surfaces before refixing or recovering.

The bed-bug

This insect is a parasite of man, its food being human blood which it obtains after puncturing the skin. But it can live for months without food. It lives and breeds in buildings and furniture, usually where it is warm, and is rarely carried by human beings.

The bug is about $\frac{1}{4}$ in. long, oval, flat and wingless, and dark brown in colour. It gives off a characteristic musty smell. Its habit is to hide in daytime and come out to feed on blood at night. Eggs are laid in crevices in mattresses, bedsteads, skirtings, mouldings and behind wall-paper. They hatch out in about three weeks.

Insecticide and fumigation treatments have already been described. In addition cleansing harbouring places with soapy water, preferably with a little soda added, is good, and if the solution touches the bugs will probably destroy them.

Fleas

This insect, like the bed bug, feeds on blood. Cleanliness both in the house and the body will quickly get rid of fleas. If found in the building wash the floors and woodwork with soapy water and soda. Crevices can be sprayed with a D.D.T. insecticide, or with a solution of naphthaline and benzine. It should be remembered that fleas are easily carried by poultry and domestic pets.

Moths

Moths and the destruction they cause to all kinds of fabrics are too well known to need further description. The moth lays its eggs in the fabric and the grub which hatches out proceeds to feed on the fabric—hence the all too familiar holes.

Moths lay their eggs usually in fabrics which are not disturbed and mostly in rather dark places. So the more you brush, shake, wash and bring forth your clothes into the light of day the less likely they are to be attacked. This applies also to curtains and carpets.

Moth balls (of camphor and naphthalene) are a deterrent to the moths, though the slight amount of gas they give off is not likely to kill the grubs unless the space is quite unventilated. D.D.T. powder is effective and should be sprinkled in drawers and cupboards, though not directly on the clothes, as some people may contract a skin irritation from continual contact with it. At spring-cleaning time drawers and cupboards should be washed out with warm soapy water and soda.

D.D.T. liquid insecticide may be sprayed along the edges of carpets and curtain valances where, especially in ill-lit positions, the moths may lay eggs. The moths themselves will be destroyed by contact with any suitable insecticide, and the vapour of certain insecticides will kill.

Flies

Flies feed on any kind of food, including decayed matter. They feed and breed on refuse of all kinds, and by doing so often carry disease germs into the house.

Any refuse which cannot be burnt should be sprayed either

Causes of Draught

Planning

The general layout of the house plan and its environment has an important effect on the presence or absence of draughts, and this is apart from the effect of the individual room plan.

A narrow house, such as that shown in Fig. II, with long passages and a number of doors on one straight line encourages draught. It acts as a horizontal flue, and if the front or the back

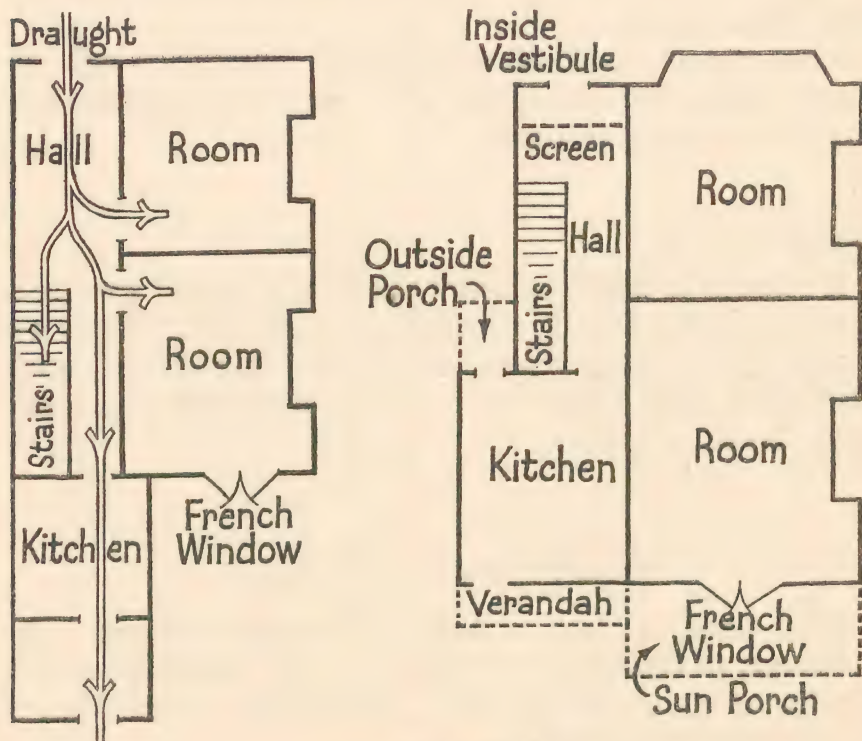


FIG. II. DRAUGHTS

Left: A type of house plan which draws the draught through

Right: How porches and verandahs can be built to screen outside doors and windows

is exposed to strong prevailing winds the hall and kitchen may be very draughty indeed. In rough weather it may be difficult to open or close doors, and doors will bang after opening. Although the other rooms are not in the direct line of draught, the pressure of the air in the hall and landings will force strong currents under doors.

If the house is exposed to the south-west, from which direction the prevailing strong winds arrive, and there are many doors and windows on this side, the strong air-pressure will cause

draughts, especially if the joinery shrinks and there are plenty of gaps around doors and windows.

The plan of the individual room is just as important. The common type of room plan is illustrated in Fig. 12, and the arrows indicate the direction of air-currents towards the fire-place. The most draughty position is usually between the door

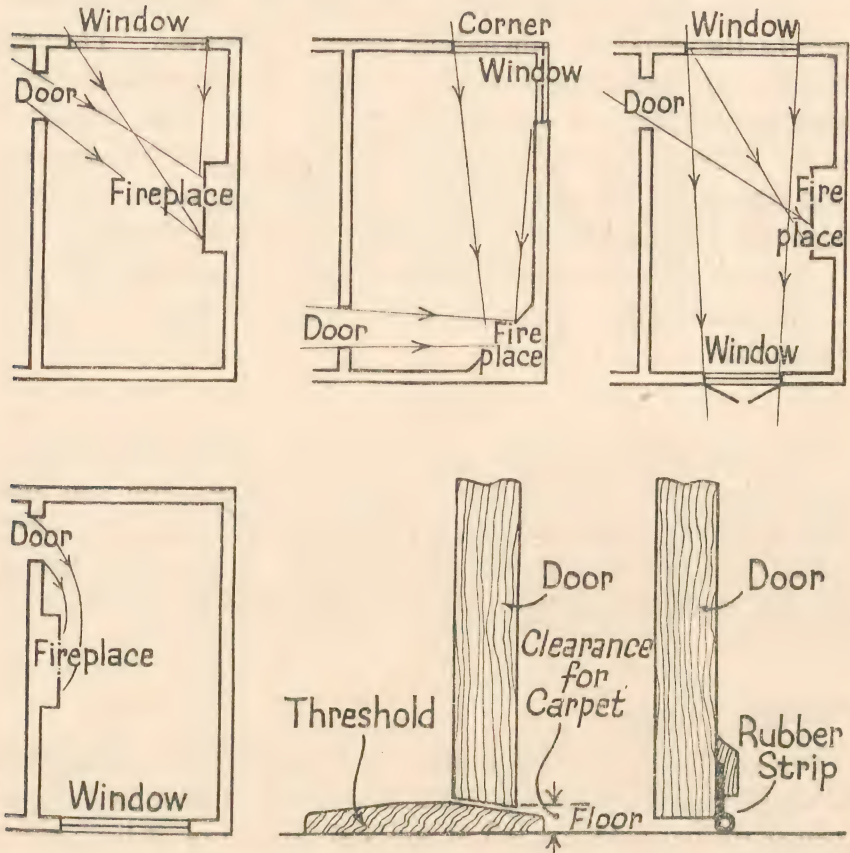


FIG. 12. DRAUGHTS: THE PLANS SHOW HOW DRAUGHTS PASS FROM DOORS AND WINDOWS TO FIREPLACES

Bottom, right: How to stop draught under a door

and the fireplace, but if the window is ill-fitting and strong winds blow against it, it may be worse between window and fireplace.

A corner fireplace opposite a door is usually bad as you are compelled to sit in the draught line.

There is much to be said for having the door at the side of the fireplace, though the room must be fairly large so that the door is not very close to the fireplace. The draught from door to fireplace is then confined to a narrow channel close to the wall.

The staircase helps to conduct draughts from downstairs across the upstairs landing and under the bedroom doors. This may be marked if the front door is exposed to strong winds.

Gaps and crevices

Generally it is better to allow air to enter the room under and around the door. It should not be allowed to enter through gaps in the windows (including French windows). Through shrinkage or poor design wind can often blow straight through the gap between the opening casement or sash and the fixed frame. There are even cases where a gap opens between the fixed frame and the wall jamb and the frame shrinks away from the inside plaster, giving another line of entry for the wind.

Gaps also open between skirtings and floor, and between floorboards, and draught may enter from under the floor via the air-bricks.

Treatment

You can to some extent alter the plan of an old house by erecting screens and porches. And, of course, you can stop gaps in joinery. But remember that a supply of air is necessary in the room, so do not stop all the gaps. If the room has no fireplace and is ventilated through an air-brick, do not block the vent.

Draughty vents

You can often cure this trouble by fitting a baffle board either inside or outside, or both. The board should be nailed to two bearers so that gaps are left at top and bottom or at both sides. This slows up the air-current by friction and also spreads it. If two baffles are fitted, one inside and one outside, one should have side inlets and one top and bottom inlets. This gives maximum protection from sudden wind gusts.

A better remedy is to fit a modern constant-flow ventilator. This fitting has built-in baffles which are automatically adjusted to the strength of air-pressure, so that the air passages are reduced in area as the strength of air-pressure is increased.

Screens and porches

If the house plan forms draught passages, as in Fig. 11, the

trouble may be greatly reduced or even cured by fitting a screen or porch to the outside door through which the air enters. But it is essential to screen the direct draught line. If an internal screen with a door is fitted in the hall, to form a vestibule, the screen door should not be in line with the outer door but should be to one side. If an outside porch is built the same applies, though it will be better to have the new door at the side, thus completely sheltering the entrance from prevailing winds.

A glazed porch can often be added to the back entrance or even a long verandah. But here again take care to place the new door away from the existing one, as in Fig. 11.

It is not so easy to do this sort of thing in the room itself, but if it is a large one a screen can be fixed opposite the door to deflect the draught.

The effect of the grate

The type of grate has some effect on draughts. If it is a large solid fuel grate with excessive air openings underneath an excessive amount of air will be drawn through the fire, and this must be drawn through doors and windows. Some flues draw more air than others, and this, too, may cause excessive draught. Attention should be given to restricting the air openings under the grate, though these must not be completely stopped or the fire will not burn brightly.

In some of the latest solid fuel grates an air inlet is provided in the hearth. This does much to prevent the room being draughty as the air supply for combustion is drawn from the under-floor air-bricks instead of through doors and windows.

Temperature of the air

A point rarely mentioned in connection with draughts entering through an inside door is that they are only noticed in cold weather. If the house is centrally heated they are rarely noticed as the air is heated before it enters the room.

Draught excluders

Bearing in mind that an air supply is necessary, you can stop those gaps which admit the worst draughts. This problem should be carefully considered. Sometimes it is sufficient to

make the hall door or the back door draught-proof. Sometimes it is better to leave these and to treat the windows only.

Strip rubber and strip wood can be used for making doors and windows draught-proof. The gap between a door or casement and its fixed frame cannot be completely sealed, but it can be so greatly reduced that very little air can enter.

Two kinds of strip rubber are available. There is plain strip and there is a strip which has a flat joined at one side to a tube,

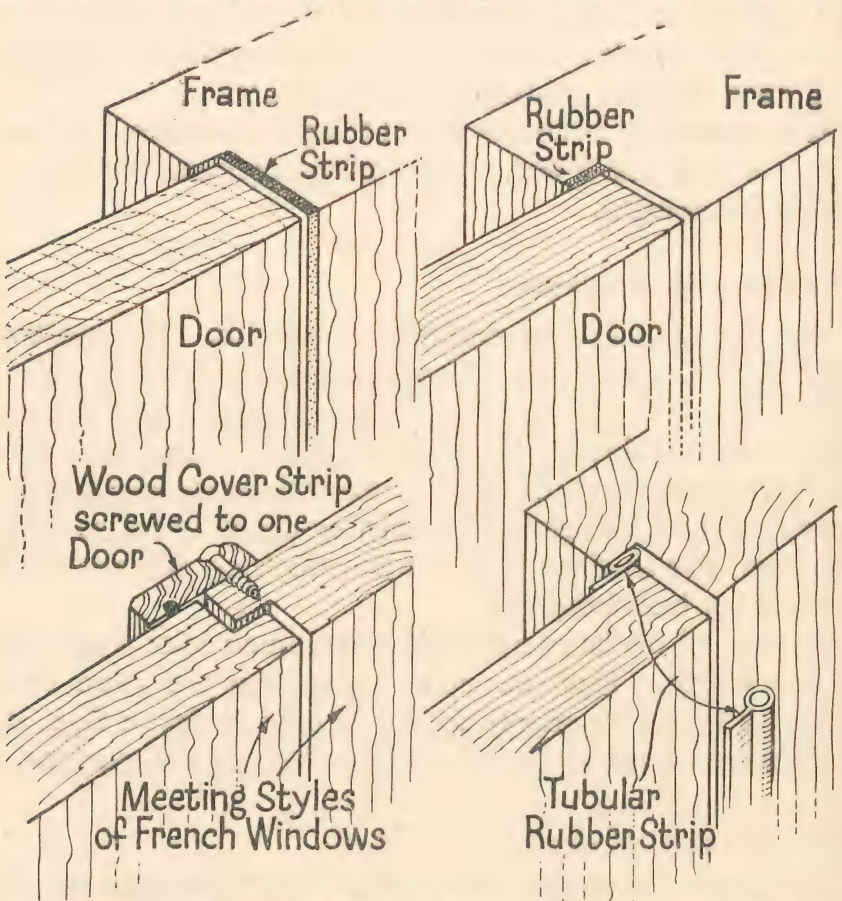


FIG. 13. DRAUGHTS: HOW TO STOP DRAUGHTS AT THE SIDES OF DOORS

as in Fig. 13. The flat strip is useful for reducing gaps. It can be tacked to the rebate of a frame. The tubular strip can also be tacked to the frame rebate and the tube part as it is compressed when the door or window is closed will practically seal the gap, as in Fig. 13.

For excluding draught from under a door the tube strip can be fixed to the bottom, as shown in Fig. 12. A strip of wood

or metal should be placed over the flat part of the rubber and the fixing screws passed through it. The tubular part should just touch the floor. There are also patent draught excluders for fixing to the bottom of a door, and these are particularly designed for outside doors.

The bottom of an inside door is sometimes cut away to allow it to pass over a carpet, but when the door is closed the deep gap admits draught. A hardwood threshold is the best means of reducing the gap. It should be sloped at each edge and bedded to the floor in thick paint, as shown in Fig. 12.

If draught passes through a wide gap between a pair of French windows a strip of wood can be screwed to the window casement which open first so that part of the strip laps over the gap, as in Fig. 13.

If draught is coming under skirtings or through open floor joints, small strips of wood can be used to close them. In some cases plastic wood is useful.

MOWING MACHINES

There are two main points about a lawn mower: first, buy a machine which will enable you to cut your lawn in comfort; and second, look after it.

Regarding the first point, something depends upon the price you can afford. The standard of design and manufacture is high, even with the cheaper mowers, but it is not fair to expect a small side-wheel mower to give good service on a tennis court or large lawn. Nor will any type of mower, however costly, give satisfactory service if it is left out in the rain and oiled only once in twelve months.

Types—Hand-operated

There are two types: side-wheel drive, and the roller drive. The side-wheel type is the cheapest and is quite satisfactory for small lawns, though the slight marks made by the side wheels are absent when a roller type is used.

There is a differential drive from each side wheel so that in turning one wheel can revolve faster than the other. The best machines are fitted with ball bearings, and if kept properly oiled

and cleaned are easily operated. The height of cut is adjustable by raising or lowering a small wood roller at the back. A curved delivery plate projects the grass into the box. A good side-wheel mower gives about forty-five cuts per yard of foot travel.

Four sizes of side-wheel mowers are made: 8 in., 10 in., 12 in. and 14 in. For the average small garden the 12-in. size is the most popular.

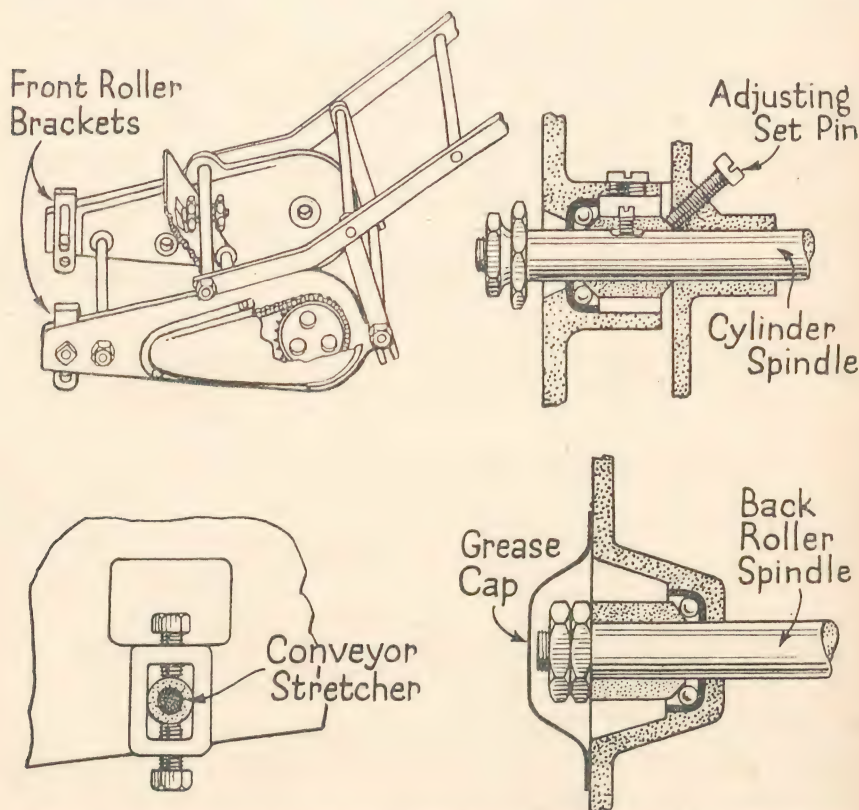


FIG. 14. SOME DETAILS AND ADJUSTMENTS OF A ROLLER-TYPE LAWN MOWER
(Qualcast, Ltd.)

Roller mowers

With this type the action of pushing the mower revolves the differential roller at the back and this drives the cutting cylinder through gears or chains. The roller is the same width as the cutting cylinder, and being at the back rolls the grass after it has been cut. This is only one reason why the roller type is better than the side-wheel type.

The action of the roller type is also smoother and there is less tendency to skidding. In some makes the handles are adjustable

for height, and the height of cut is adjustable by turning a hand-screw.

The more expensive types have various refinements which are worth the extra cost. In one make, for example, the cutting cylinder is interchangeable with a brushing cylinder and a spiked cylinder which pricks the turf and aerates it.

Types—Power-operated

The effort of pushing a hand-operated mower is well within the capacity of any normal adult provided the lawn is level and not much above 150 sq. yds. in area. But it is hard going uphill, especially if you have let the grass grow much. You can, of course, mow at right angles to the incline. Generally, it is best to mow the long way of the lawn, as this gives the minimum number of turns.

Some people enjoy pushing a mower, others find it not only strenuous but boring. For the latter a small power-operated mower is well worth the cost. But in any case the large lawn calls for a power machine, as one can work much quicker, and when the grass is growing fast even the brawny gardener will be inclined to neglect the lawn if a power machine is not used.

Most power-operated mowers are of the roller type, already described, but the drive comes from the motor. Incidentally the tendency to skid which is noticeable in all hand-mowers is almost non-existent with the power machine.

The smaller types are 14 in. wide, and the petrol motor consumes five-eighths of a pint per hour or little more. The larger types are 16 in. and upwards. For the average small lawn the 14-in. type is sufficient, and the 16-in. adequate for anything up to tennis court size.

The ordinary mower cuts by the grass being caught between the cutting cylinder and the fixed blade, but there is also a scythe or scissors type, power-operated. In one make of this type the grass is drawn into an enclosed box by suction.

The small petrol motors used in most makes are very reliable, easy to start and control and will last a long time without requiring complete overhaul. But at least one make of mower has electric motor drive with a trailing cable connected to the house mains.

Use and Maintenance

Most mowers are adjusted before leaving the factory to cut paper $\frac{1}{250}$ in. thick, and no adjustment should be necessary for some time, so do not meddle.

Clean the mower after each use and wipe the blade and cutting cylinder with an oily rag. Corrosion of the cutting edges will quickly reduce the efficiency of the power.

The bottom blade must be properly adjusted in relation to the cutting cylinder. If they are not close enough the grass will be bruised or torn. If they are too close the machine will be hard to push or drive. If they are closer at one end than the other more grass will be cut from the close than from the other end.

After some time the bearings will wear and the movement of the cutting cylinder will be "sloppy." An adjusting set pin is provided to take up the slack as shown in Fig. 14, but the grub screw must first be slackened after removing the cover screw. Tighten the grub screw and replace cover screw after adjustment. If correctly adjusted the cylinder will spin freely.

The bottom blade is usually adjusted by means of small hand wheels. In the mower illustrated in Fig. 14, to bring the cutting edge of the bottom blade closer to the cylinder, a hand-wheel is slackened and another tightened. To lower the bottom blade reverse the operation. The two screws on the conveyor stretcher are for aligning the bottom blade with the cylinder.

The back roller bearings are adjusted by removing the grease cap, slackening the lock nut and tightening the nut under until the play is removed. The lock nut should then be re-tightened.

Sharpening

If the blades are wiped with an oily rag after each use and care is taken to remove small stones and debris from the grass before cutting, the cutting edges will remain keen for a long time. Re-sharpening should be done by an expert, but special stones are sold for the purpose. As the cutting edges are flat the object of re-sharpening is to restore the perfectly flat edges so that the grass is evenly sheared between the cylinder and the fixed blade.

Finally, remember that *regular* attention and oiling are necessary. A few months neglect will ruin any mower.

HOW TO MAKE A GARDEN ROLLER

You can make a garden roller of concrete. There is no great difficulty about the job provided you can get suitable material for the framework and the steel shaft and handle.

Weight and size

Concrete is heavy stuff. Using shingle or crushed limestone it will weigh about 140 lb. per cubic foot. Now a roller weighing $1\frac{1}{2}$ cwt. is quite heavy enough for rolling the lawn, which means that your roller must not contain much more than 1 cu. ft. of material.

The weight can be worked out by calculating the volume. The volume of a cylinder = $D^2 \times 0.7854 \times L$. Where D is the diameter and L the length.

In the case of the roller illustrated in Fig. 15, D is 1 ft. 3 in. and L is 1 ft. 9 in. The volume is approximately 1.72 cu. ft., and taking concrete at 140 lb. per cu. ft. the weight solid will be approximately 240 lb. This is well over 2 cwt. and too heavy for the average person. Moreover, the diameter is small for the weight and the roller will tend to sink on soft ground.

The weight can be reduced for a given size by making the roller hollow, and this can be quite simply done by placing an empty tin box (a round one) inside as the concrete is placed. The section at the bottom of the Fig. shows a hollow 12 in. long

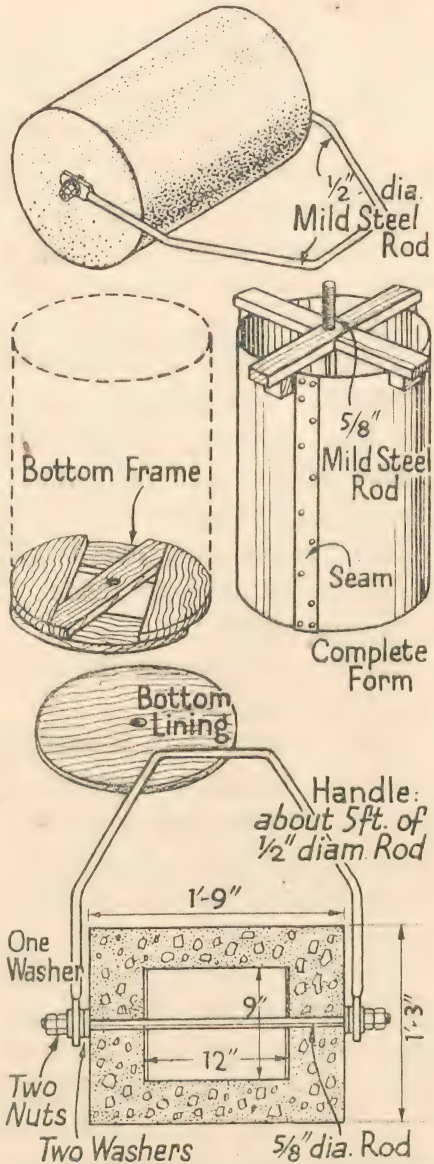


FIG. 15. A HOME-MADE GARDEN ROLLER OF CAST CONCRETE

by 9 in. diameter, and this reduces the weight by about 80 lb., bringing the weight of the roller down to about 160 lb., which is quite enough.

Formwork

The only difficulty is obtaining a perfectly cylindrical form into which the concrete can be placed. The perimeter must be a true circle, because any unevenness will make the roller bump as it is used and, instead of flattening, the rolled surface will produce a series of ridges and hollows.

You may be lucky enough to find a drum or tub of suitable shape. Barrels, of course, are useless as they are not true cylinders.

Failing a suitable tub you must make a cylinder out of thin plywood. The first step is to make the bottom frame shown in the Fig. Set out the diameter on a sheet of brown paper or cardboard first and then cut it out for use as a templet. The frame can be made with four sides and one diagonal, as shown. A hole for the shaft must be drilled in the diagonal, and it must be in the centre of the circle. You can mark the true centre by using the templet.

Now cut the bottom lining from a piece of plywood and drill a hole in the centre.

The cylinder form is made by bending a sheet of plywood, using the frame as a guide. The seam is butt joined with a strip of plywood nailed over to secure the joint. Drive the nails from inside and clench the ends. Nail the bottom of the cylinder to the edge of the circular frame. Then place the bottom lining in position.

Two cross pieces are required to secure the top of the form and a hole should be drilled in the middle so that you can slip the shaft through it. If you are using a round tin box to make the interior hollow, holes must be drilled in the ends and it must be slipped on to the shaft before placing the cross pieces in position. Take care to place it in the middle or your roller will be heavier one side than the other.

There is some danger of the wet concrete distorting the sides of the form. To prevent this happening dig a hole in the ground about half the depth of the form and bank the excavated soil against the upper half. This will support it.

The concrete

The concrete should be fairly strong and dense. 1 : 2 : 3 mix is suitable, which means taking 1 bucket of loose cement, 2 buckets of damp sand and 3 buckets of shingle. The shingle should not exceed $\frac{3}{4}$ in. in size. As a guide to the amounts required, if you get $\frac{1}{4}$ cwt. of cement, 1 cu. ft. of sand and 1 cu. ft. of shingle you will have enough and some to spare, even if the roller is solid.

Mix the dry cement and sand on a clean wood platform and then add the shingle or other coarse aggregate. Mix thoroughly in the dry state and then get an assistant to add the water through the rose of a watering can while you turn the materials over and over with the spade. The wet mix should be fairly stiff, but mix it thoroughly.

Before placing the concrete the inside of the form should be oiled or coated with whitewash to prevent the concrete adhering. Place the concrete in 4-in. layers and tamp it well to consolidate it and drive out air bubbles. A short piece of 3-in. $\times$ 2-in. timber makes a good tamper.

Leave it for a week before removing the formwork. Now you have the roller with the steel shaft set in it.

The Steelwork

The shaft and handle shown in the Fig. would have to be made by a blacksmith or engineer (unless you are exceptionally good at metalwork yourself). A thread is screwed on each end of the shaft to take the nuts. The hole at each end of the handle should be a loose fit on the shaft. The first nut should not be turned up tight against the washer but should leave a comfortable clearance. The second nut acts as a lock-nut and is tightened against the first. It will be better if the nuts fit rather tightly to the shaft thread. The washers should be greased and this will lubricate the hole in the handle ends.

POULTRY BUILDINGS

To keep poultry in healthy condition suitable accommodation is essential. Fowls are subject to many diseases which they readily catch if the living quarters are dirty, cramped, ill-lit or ill-ventilated. If you find anyone who is exceptionally successful

with poultry the reason will be found largely in the design of the poultry houses.

It is not that elaborate construction is needed. Indeed, there is much to be said for simplicity. But the houses must provide for :

Easy cleaning.

Good ventilation without draughts.

Plenty of daylight.

Adequate space

Shelter from strong winds and sharp frosts.

Dryness under all weather conditions.

Location

Place the house in a sheltered position with the front facing south-east if possible. Direct sunlight is as important as cleanliness in preventing disease. But draughts must be avoided, and this point must be carefully considered both in the design and siting of the poultry house. Although shelter from the prevailing winds is desirable it will be found that a fairly open position is better than a narrow gap between two buildings. Such a gap forms a gully through which the winds cut very sharply.

A shaded position should be avoided, though partial shade is suitable. Low-lying sites may be damp (on a clay subsoil they invariably are). If the poultry houses are placed on a slight rise so much the better as surface water will rapidly drain away.

Most people prefer to place the poultry houses in an inconspicuous position, but the health of the stock should be the first consideration. It will help feeding and keep the birds active if they can be turned on to a rough stretch of grass or weeds occasionally, though they will soon clear a small patch.

To keep the fowls off the garden (they will, of course, ruin the cabbages and many other plants if they are let loose) you must either confine them to a spacious scratching shed or to an open run, the latter being enclosed in wire netting. Make the space as big as possible. The extra cost of netting and stakes will be well worth while.

A Small Poultry House

Fig. 16 illustrates a small poultry house of simple construction which provides ample space for half a dozen fowls. The construction is so simple that even the inexperienced handiman

need not fear to undertake it. The framing should be 2 in $\times$ 2 in., and it is better to use planed material as this is easier to clean. Any kind of grooved and tongued boards can be used, but the deeper the grooves and tongues the better, and the thicker

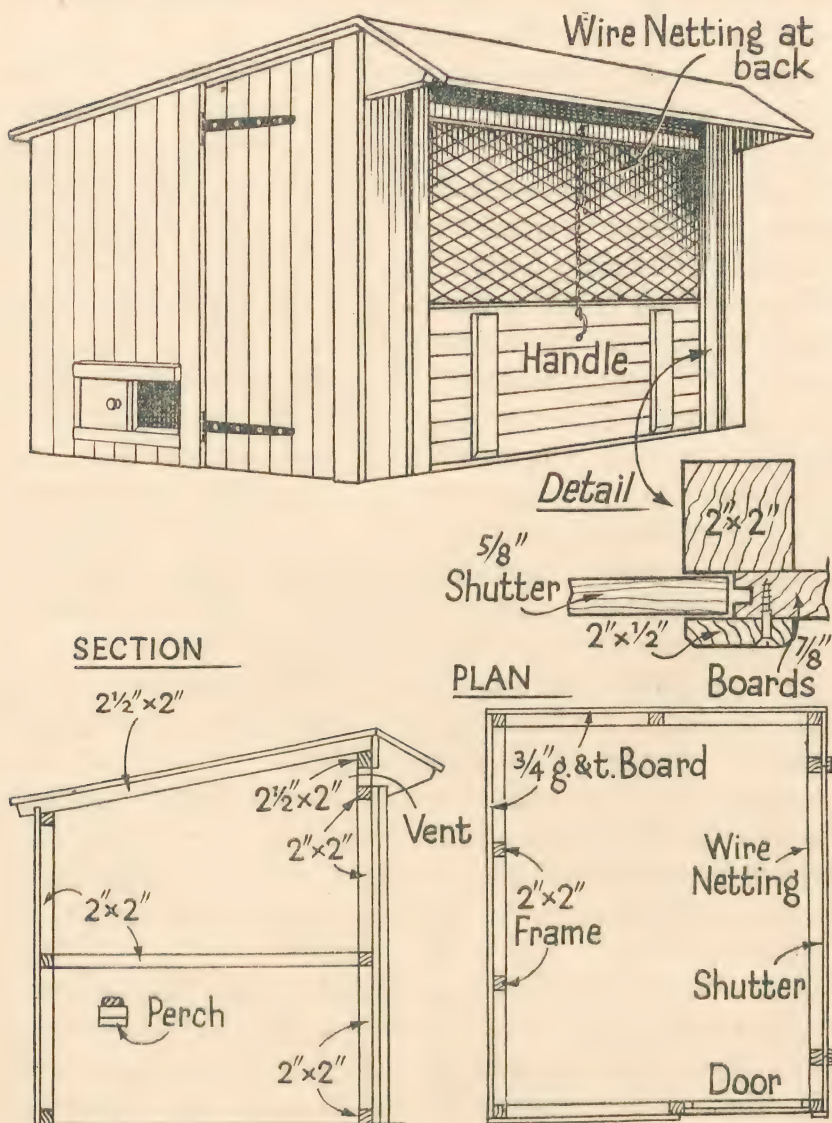


FIG. 16. A SMALL POULTRY HOUSE

the boards the warmer the house will be in severe weather. A thickness of $\frac{3}{4}$ in. is a desirable minimum. On no account should boards with plain butt edges be used as these will admit draught.

The floor should also be of grooved and tongued boards nailed to 2-in. by 2-in. framing. The roof may be of boards with plain edges covered with bituminous felt, but it is better to use grooved and tongued boards. Give the roof an overhang all round so that water drips clear of the walls. The overhang should be generous at the front—6 in. at least.

A perch should be fixed about 2 ft. from the floor. A narrow flat board with rounded edges, about 2 in. wide by 1 in. thick, is better than a round section. A nesting box divided into compartments about 10 in. wide should be placed inside the house, though it is better to construct it as a projection on the outside (this will be described later).

A door of full height is necessary to give access for cleaning. The small door for the use of the fowls should be about 9 in. wide by 12 in. high fitted either with a sliding door or one hinged at the bottom. The advantage of the bottom hinged door is that when let down it forms a sloping walk for the fowls.

Ventilation is provided by leaving a gap of an inch or two at the top of the front, as shown. The roof projects to shelter this opening from rain. Better shelter can be provided by constructing a projecting hood, as shown, and this hood gives good shelter to the whole front.

The upper half of the front is open, with a strong wire netting screen stapled to the frame inside. This opening can be closed at night by raising the wood shutter.

You can vary the construction to suit the material available. The essentials in the frame are the corner posts, the horizontal members at top and bottom and the door frame. The roof can be constructed as a separate section and fixed when the walls are complete.

Quite a sound job can be made by using second-hand material—even packing cases. But make sure that the walls are weather-tight. Plywood is not suitable (unless it is the resin-bonded type, which is water-resisting). If you have some plain sawn boards, plane both sides and edges and cut strips about 2 in. wide to nail over the vertical joints. Just before fixing these strips give the inside face a coat of thick paint which will adhere to the boards and keep the weather out.

Whether the floor is of earth, wood or concrete, raise it as a platform to keep it dry.

The inside should be whitewashed, and re-whitewashed every year to keep it clean, and the outside painted or creosoted.

A poultry shed should be thoroughly cleaned out at least twice a week and fresh straw placed in the nesting boxes.

Span-roof Poultry House

The poultry house illustrated in Fig. 17 is larger than the previous example. It has a span roof and the upper half is open on both sides, thus giving maximum light and air. But a sheltered site will be required, since when the shutters are open the wind will be able to blow straight through. In rough weather the shutters on one side only should be opened.

This type can be made any size required. The width of 6 ft. 6 in. should not be exceeded, but it may be any length up to about 12 ft. A length of 8 ft. will accommodate about 40 fowls.

Sectional construction is suggested for this design, and the cross-section shows the walls, roof and floor separated. The framing material is 3 in. by 2 in. (if planed, as it should be, the finished size will be slightly less). The roof is made in two sections which are nailed or bolted together at the ridge.

The perches are fixed over dropping boards. These boards enable the floor to be kept fairly clean, and the job of cleaning the inside is made easier.

The detail at "A," shown in the Fig., is one method of providing for the vertical sliding shutters so that they will not swing out.

In this design there is a nesting box projecting outside. This should be fixed near the floor, and it has a hinged top which can be lifted so that the eggs can be taken without entering the poultry house.

It would be an improvement to this design to have the shutters made in the form of glazed frames. Glass is strongly recommended by the poultry experts as it ensures plenty of daylight even when the shed is closed up, and is especially valuable in bad weather.

For an exposed site it would be better to have fixed glass lights at the back with shutters and wire netting at the front.

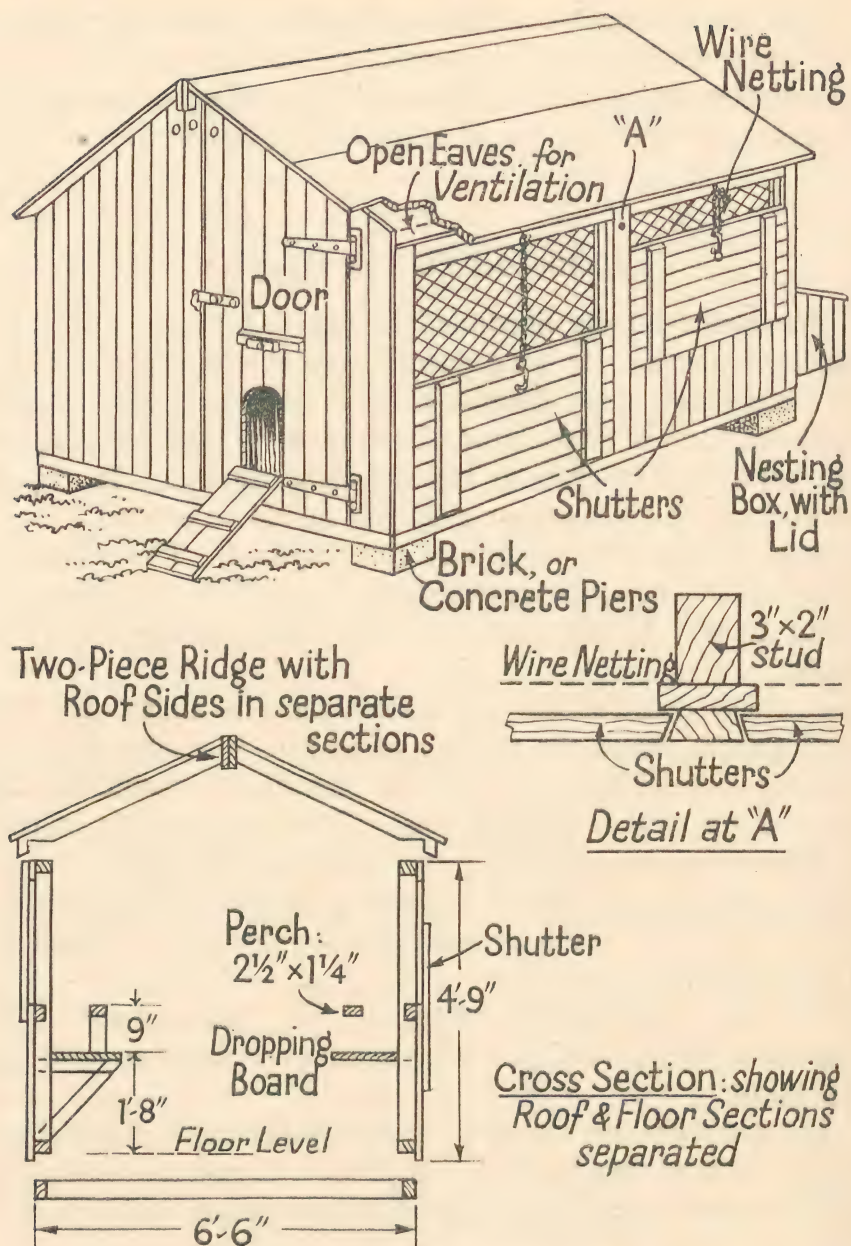


FIG. 17. A LARGER POULTRY HOUSE

The Covered Run

Where space is restricted it is advisable to build a roost shed and a covered run or scratching shed in one building. An example is illustrated in Fig. 18. The roof is of the lean-to type.

Like the poultry house just described, this one could most conveniently be built in sections, nailed or bolted together. In case of removal sectional construction is a great advantage as the sections will pack flat.

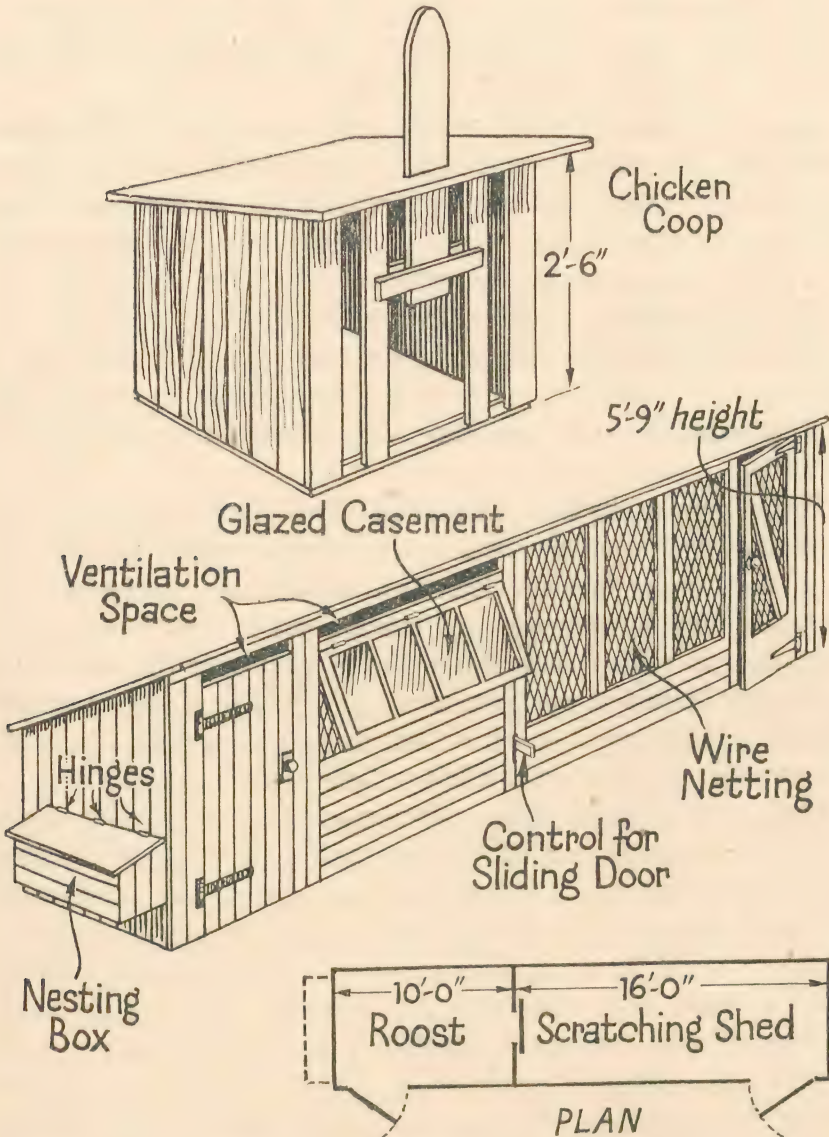


FIG. 18

Top: A chicken coop

Bottom: Poultry house and scratching shed

The roosting house has a wood floor, but the scratching shed has an earth floor which should be covered with grit or crushed furnace ashes. As the roost floor must be raised clear of the ground it is convenient to build brick foundations—brick piers

for the roost and continuous walls for the scratching shed. To prevent damp rising from the ground and soaking the timber lay a damp-proof course of bituminous felt over the foundation wall and cut out squares of felt to place on the piers.

It will be noticed from the Fig. that the small sliding door between roost and scratching shed is controlled from outside by a handle projecting through the front.

Another unusual feature of this design is the top-hung glazed casements. As already stated glass is better than a wood shutter. By having the casement top hung with a pair of casement stays at the lower sides it can be opened up to 45 degrees for ventilation and at the same time provides good shelter from rain. A wire netting screen should, of course, be fitted at the back.

The heights of the designs given here should be taken as a minimum. It is better to make the height 6 ft. at the highest part (inside) so that you can walk about in comfort when cleaning.

Some poultry keepers prefer an earth floor on which they place straw with a little sand or lime dust, contending that this is at least as easy to keep clean as a wood floor. Unfortunately an earth floor is absorbent and the ground is bound to become unhealthy in time. One method of getting over this is to fit a projecting handle at each corner of the shed so that two people can lift it and move it to a fresh site from time to time. The old site can then be dug up and left to "sweeten."

On a cold or damp site a raised wood floor is dry and warm. If the floorboards are of western red cedar, which contains natural preservatives, it will not encourage parasites. With well-seasoned material and the boards cramped tightly together the surface should be quite easy to clean. It is a good thing to cover a raised wood floor with fine concrete, about $1\frac{1}{2}$ in. thick. A layer of wire netting or expanded metal nailed down to the boards will provide a good key for the concrete. The boards should be creosoted. If concrete is laid direct on the earth it should be placed on a foundation of brick rubble well consolidated. This will insulate the floor and keep it warm. The concrete should be about 3 in. thick, the surface being trowelled smooth and treated with a waterproofer which will make it impervious.

Although the material used in constructing poultry buildings

can be light and no elaborate joints are necessary, see to it that everything is firmly fixed. If the boards are thick and strong it will be easy to make a sturdy job. As already stated, $\frac{3}{4}$ -in. board thickness is the medium in good construction, and the tongues and grooves should be deep. Cramp the boards tightly together and see to it that they are well seasoned before fixing. Otherwise the joints will open.

It pays to buy good quality roofing felt. The quality purposely made for poultry buildings is usually very thin. Thick three-ply felt not only lasts longer but improves the insulation. Avoid the mistake which so many amateurs make of securing the felt by nailing battens or laths over it. It should be secured with galvanized clout nails. All laps should be put together in bituminous cement, and after nailing the seam should be painted over with this cement. Do not tar the surface. With a good bituminous felt this is quite unnecessary. At the edges turn the felt down about $1\frac{1}{2}$ in. and nail it to the edges of the boards, afterwards giving each edge a coat of bituminous paint. If you use good material and lay it properly it will last for many years.

GREENHOUSES AND FRAMES

The structure of a greenhouse and a cold frame is essentially an arrangement for holding glass. So with the exception of the solid part below the sill the structure is all framework. The edges of the framing members are rebated to receive the glass. There must be a door at one end and opening lights in the roof, and it is an advantage to have at least one opening light at the side. If it is intended as a hot house provision must be made for heating apparatus.

Size

The minimum width is 5 ft. This allows a central gangway 2 ft. wide with stages or shelves on each side 1 ft. 6 in. wide. If wider shelves or multiple staging is required the width should be increased. A width of 7 ft. will allow wide two-tier staging.

The length depends upon the amount of stuff you wish to grow, but 7 ft. 9 in. should be taken as a minimum. You can add to the length later, and this will be quite easy if you make

the end as a separate section secured by bolts. It can then be taken out without difficulty when you wish to extend and refix after adding the new length.

The height should allow a 6 ft. 6 in. door to be placed in the middle of one gable end, and this, of course, will give you standing headroom down the middle of the floor. But the height at the eaves must be sufficient for the stuff you wish to grow, and 5 ft. is the minimum for general purposes.

The sill should be kept as low as possible so that plants can be placed low down and thus the best made of the available headroom. With one shelf the sill should not be more than 2 ft. from the floor.

Foundation

Although a greenhouse is a light-weight building it must have a proper foundation. You can have a wood or concrete floor, the latter being preferable. If you have a wood floor it must have a ventilated space underneath, as shown in Fig. 19. In any case it is advisable to lay a bituminous felt strip as a damp-proof course so that damp rising from the ground cannot penetrate the sill plate.

If you have a concrete floor let it stand above ground, but remove the surface soil and fill up with broken brick or stone. Level and ram this and then lay 4 in. of concrete on it. Place boards around the edges so that the concrete can be finished straight and turned down into the ground, as in Fig. 20. This will make a dry floor which will also be warmer than a floor laid direct on the ground.

The part beneath the sill can be of boarding nailed to the frame or of brickwork or concrete blocks. Bricks or blocks are better than timber for this as they provide better insulation and so will retain heat longer. By distempering the inside a smooth clean surface is given which will not harbour insects so readily as woodwork. With a concrete floor the brickwork can be built directly on the floor. Lay a damp-proof course of bituminous felt on the top course of bricks, directly under the sill.

The bottom part may, of course, be boarded, as in Fig. 19, and the bottom plate may be fixed direct to the wood or concrete

floor. If the floor is concrete lay a damp-proof course strip directly under the bottom plate. With a wood floor lay it under the floor frame or joists. A point to watch if you have a concrete

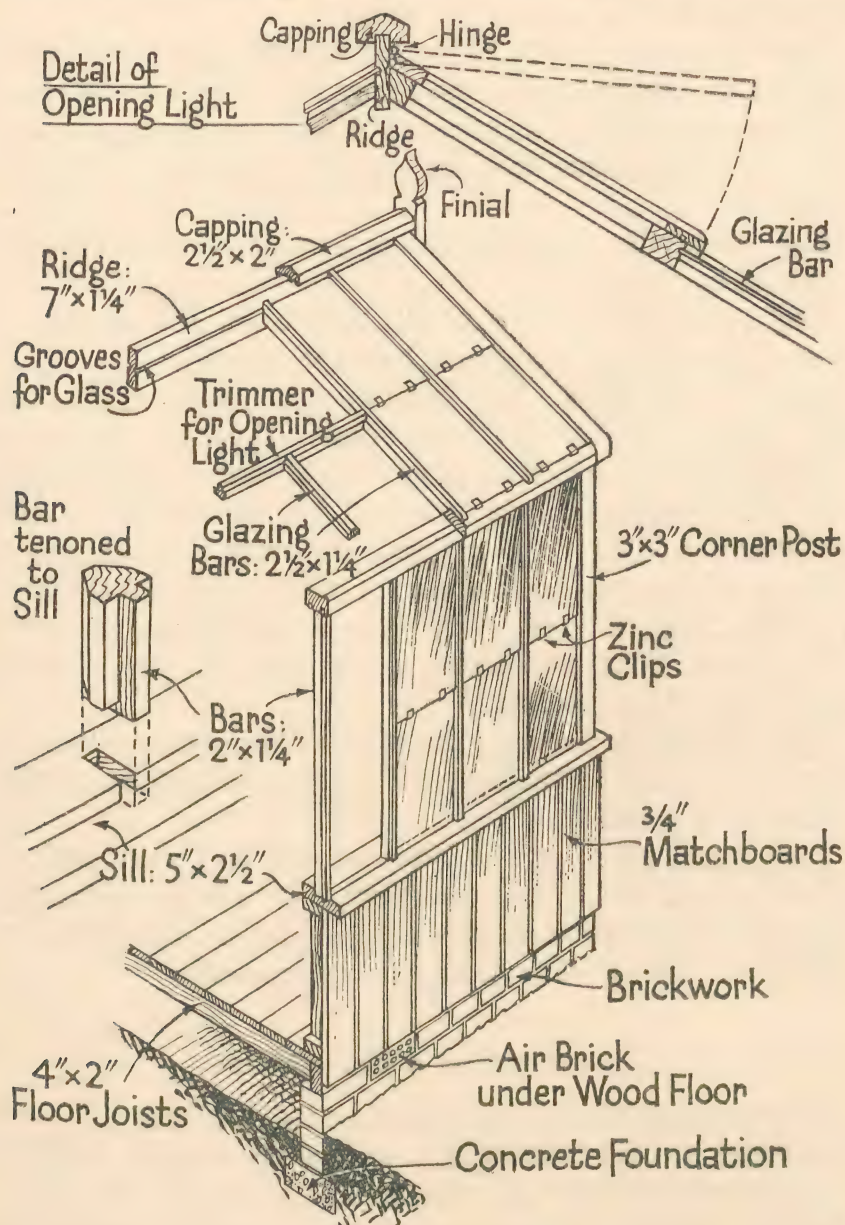


FIG. 19. GREENHOUSE DETAILS

floor is that the outside boarding should stand beyond the edge of the concrete so that rainwater running off the boards does not collect on the edge of the concrete.

Specification

The following sizes will make a strong job, though they may be slightly more or less according to material available. The sizes are for deal or western red cedar.

Sides: top rail 3 in. by $2\frac{1}{2}$ in., sill 5 in. by $2\frac{1}{2}$ in., plates and studding for timber lower part 3 in. by 2 in., bars 2 in. by $1\frac{1}{4}$ in. Corner posts 3 in. by 3 in. rebated for glass, ventilating window. 2 in. by $1\frac{1}{2}$ in. frame with $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in. bars to be top hung.

End: gable rail 3 in. by $1\frac{1}{2}$ in., door frame 3 in. by 2 in., glazing bars 2 in. by $1\frac{1}{4}$ in.

Roof: top ridge 7 in. by $1\frac{1}{4}$ in., bottom rail 4 in. by $1\frac{1}{4}$ in., gable ends 4 in. by 2 in., glazing bars 2 in. by $1\frac{1}{4}$ in.

Glass: 21 oz. sheet. The usual method of glazing is to use short lengths of glass of "horticultural" quality. This glass contains blemishes which are of no consequence in a greenhouse. The lengths of glass should be lapped $\frac{3}{8}$ in. on the roof. They are bedded on putty and sprigged, but front putty is usually omitted, and this has the advantage of making replacements easy. Zinc clips may be used, as in Fig. 19, to prevent the glass sliding down, but if the bedding and sprigging is very carefully done these are not essential.

The glass on the vertical sides may be butt-jointed instead of lapped, and if the abutting edges are cleanly cut and square this will be quite satisfactory.

Full length sheets front puttied as well as bedded make a neater job, and if the structure is intended to be an ornamental hot-house this method should be adopted. In that case sheet glass of seconds or thirds quality should be used.

Constructing a Greenhouse

A greenhouse may be built up piece by piece, but it is more convenient to build it in sections for bolting together. With a small greenhouse, say 6 ft. wide by 8 ft. long, each wall can be a separate section. The roof can be made in two separate side sections (for the span-roof type) with a separate ridge. By this means much of the work can be done on the bench, and the assembling of the parts can be done on a flat stretch of paving or even on the lawn.

The most difficult parts to make are the door and the opening lights, so it will be better to buy these ready-made.

The floor

If you are having a concrete floor, first excavate the top soil and fill up with a layer of broken brick or stone, as already described. This must be well rammed and the surface should be about 1 in. below the ground level. The concrete slab should be at least 3 in. thick. Use a 1 : 2 : 3 mix, which for a 3-in. thickness will require the following materials per square yard: 40.1 lb. cement, 1.15 cu. ft. of damp sand, 1.78 cu. ft. of shingle. The shingle should not exceed $\frac{3}{4}$ in.

Start by fixing board forms around the edges, securing them with pegs driven into the ground so that the concrete cannot push them outwards. The top edges should be carefully levelled with a spirit level. Place the concrete and spread it with the spade so that it is about 1 in. above the boards. Then take a straight board and "screed" the concrete by resting the board edgewise on the forms and working it over the concrete with a chopping motion. This will level it. Then smooth the surface by drawing the board over it.

If you have a wood floor use 1-in. grooved and tongued boards, preferably of western red cedar which is practically rot-proof, and nail them to 3-in. or 4-in. by 2-in. joists spaced 18 in apart. A 1-in. board should be nailed across the ends of the joists if the lower part of the sides is to be boarded. The bottom of the boards can then be nailed to this, as shown in Fig. 19. The floor can be made in one section if the length is not greater than 8 ft.

The sides

If the lower part is to be of brickwork build this first. A wall thickness of $4\frac{1}{2}$ in. (half-brick) is sufficient, but lay the bricks carefully in cement mortar (see p. 281 for hints on bricklaying). Take the final measurements for the sides from the finished brickwork.

Whether the lower sides are of brick or wood take the sill as the first framing member for preparation. This should be cut back at the ends to fit the corner posts and angle mitred. Mark

the positions for the upright glazing bars, taking care to space them evenly so that the glass will be of similar width throughout. It is advisable to buy the sill in a ready-made length—that is with the weathered and rebated upper edge and throated underside. But you can use a plain piece of 5 in. by $2\frac{1}{2}$ in. and nail a strip of wood $\frac{3}{8}$ in. thick to form a rebate for the glass. This strip should be bedded in thick wet paint. The glazing bars are tenoned to the sill and mortices must be cut in the sill as shown in Fig. 6. You can start the mortice by drilling each end and then use a wood chisel to complete the job. If you use a strip of wood to form the glazing rebate you can drill one hole and then make two saw cuts to form a slot, and when nailed to the sill this will give you the mortices for the bar ends.

Now take the corner posts, which must be rebated to take the glass edge, or fitted with a strip of wood to form a rebate, as already described for the sill. Cut two posts to length.

If the lower part of the sides is of wood, frame this up, using 3-in. by 2-in. material for the floor plate and sill plate and studs. A stud should be placed to come under every alternate glazing bar. Join the plates (or rails as they are sometimes called) to the corner posts by housing them in about $\frac{1}{4}$ in. and then nailing through the posts into the end grain of the plates. See that you have the framing all square and then fix the sill piece. Then nail the vertical grooved and tongued boards on. The other side can be made to the same size. For the time being leave the glazing bars and get on with the ends.

The ends

One end will have the door in the middle, so start this first by taking the door frame (which it is better to buy ready made with the door) and laying it flat on the ground or yard build up the end framing round the door frame. With the other end proceed in a similar way to that described for the sides.

Now prepare the vertical glazing bars for the two ends and the two sides, taking care to allow for the tenons at both ends, for they must be tenoned into the top rail as well as into the sill.

Cut the mortices in the top rail (sides). Instead of rebating this rail for the glass it can be grooved and the head of the glass pushed up into the groove.

If you are cutting a birdsmouth in the feet of the roof glazing bars so that they will "sit" on the top rails, the top rail can be left square, but if you are making the roof as a separate section you must chamfer the edge of the top rail, as shown in Fig. 19, so that you can screw the eaves rail of the roof to the top rail of the sides.

The gable rail to complete the ends may give you some trouble. But it is not strictly necessary to cut mortices in these rails for securing the upper ends of the glazing bars. The bars should be cut to the roof angle and can then be skew-nailed to the gable rails. This will simplify matters.

Top rails and glazing bars can now be added to complete the sides and gable rails and glazing bars to complete ends. Then the sides and ends can be erected and bolted together.

The roof

The dimensions for the roof should be taken off the walls as erected as there may be slight variations in the dimensions. If you are making the roof in two sections (one for each side), construct each section as a large glazed frame.

An important detail is the eaves rail. This is not as thick as the glazing bars and side and head of the frame. It is like the bottom rail of a cold frame (see Fig. 21) and the ends of the glazing bars and side members of the frame are notched to it. The heads of the bars should be tenoned to the top rail. This top rail should be planed on the upper edge to an angle so that it is vertical when the roof section is fixed to the correct slope.

A separate ridge board should be fixed, supporting it on the gable apex at each end (a small space being left at the gable apexes for this purpose. When the roof sections are placed in position they can be screwed or nailed to the ridge, the gable rails and the top side rails.

Opening lights should be constructed in the same way as cold frame lights (to be described shortly). Joints between head and side members should be tenoned. This is rather a tricky job and it is better to buy these lights ready-made unless you are an experienced handyman.

The roof glazing bars must be trimmed to form an opening for the opening lights. All joints should be tenoned. By the way, when making joints, put them together in thick white lead

paint while the paint is still wet. This makes a firm watertight joint. A thin nail driven through the two pieces will help to secure the joint.

A lean-to greenhouse

If you have a high wall you can build a greenhouse against it, with a lean-to roof. This will be a simpler job and not so much

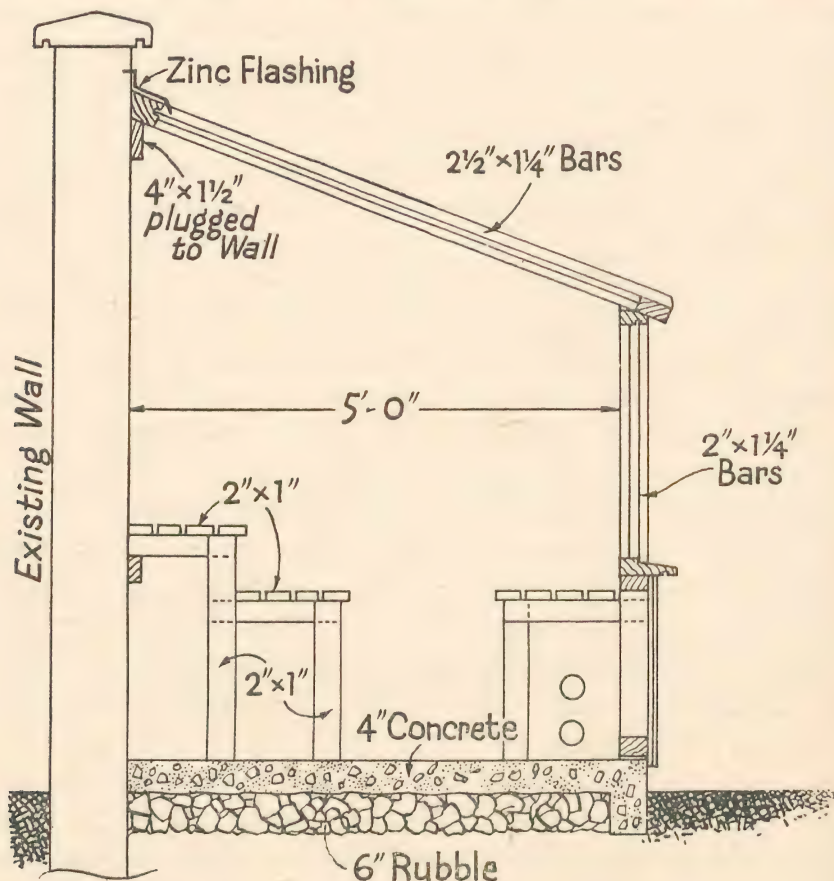


FIG. 20. SECTION THROUGH A LEAN-TO GREENHOUSE BUILT AGAINST A BRICK WALL

material will be required. But the aspect of the wall must allow plenty of sunlight to fall on the glass. If the wall faces north it is obviously unsuitable.

You will probably find it easier to build up a lean-to greenhouse piece by piece, starting by fixing end posts to the wall. Use patent fibre or metal plugs and screws for making all fixings to the wall. Wood plugs will pull out or rot in time. A section is illustrated in Fig. 20.

Cold Frames

A cold frame is simple enough to make except for the lights, and unless you are good at mortice and tenon joints it is better to buy the lights ready-made.

You can, however, simplify the construction of the lights by

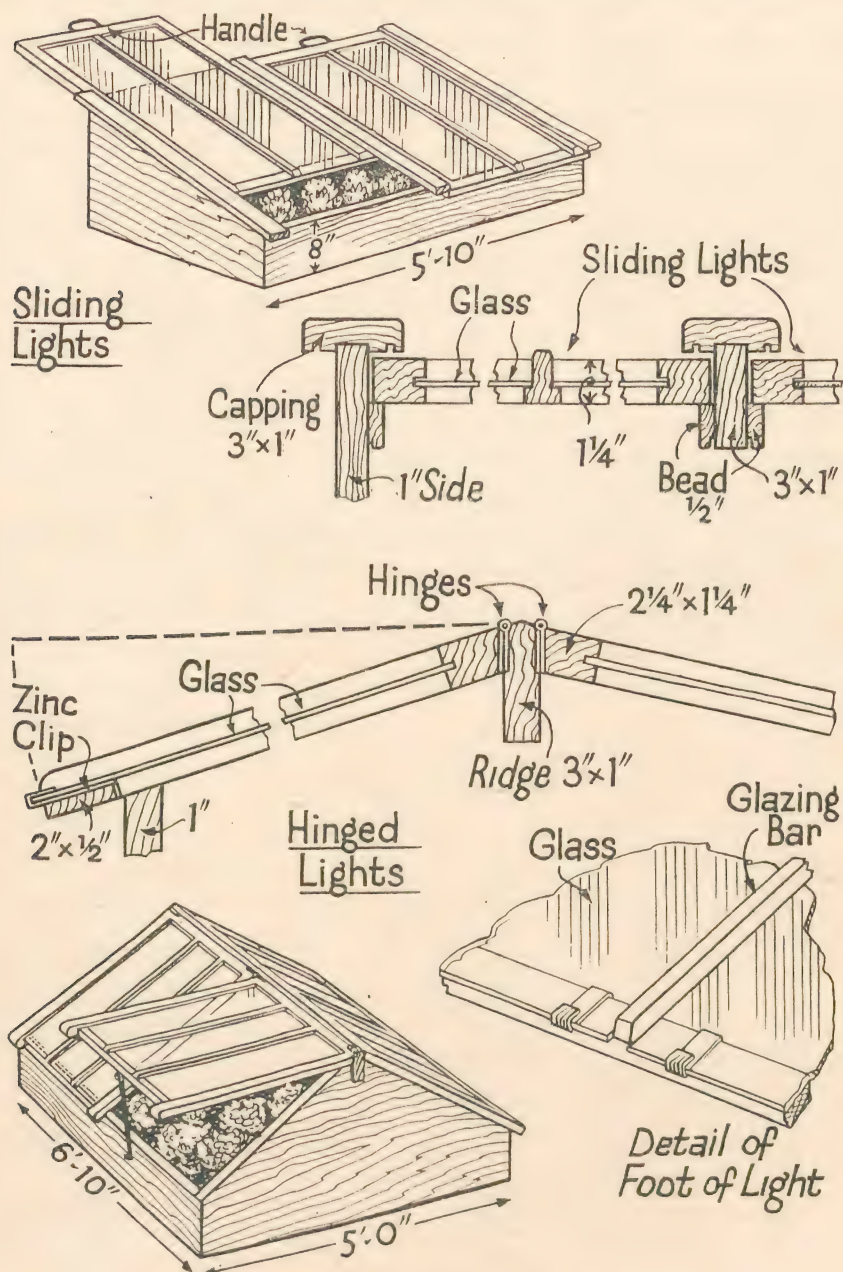


FIG. 21. COLD FRAMES—TWO TYPES

forming halved joints at the top corners and securing them with screws. This is not the best joint for the job, but if you put it together in thick white lead paint it will stand fair treatment.

The bottom rail of the light is simply a strip of wood 2 or 3 in. wide and the thickness, as you will see from Fig. 21, equals the distance from the underside of the glass to the underside of the glazing bar so that the glass passes over the rail. Notch the side members of the light and the end of the glazing bar over this rail and secure them with screws. The reason for keeping this rail under the glass is to allow the rainwater to run off. If the bottom rail were the same thickness as the top the water would be trapped.

The lights can either slide up the frame or be top-hung to a ridge. Fig. 21 shows both types. Nail the sides to corner posts about 2 in. by 2 in. These posts should extend below the frame so that they can be buried in the ground.

In the frame with sliding lights the capping shown can be dispensed with, but then if the lights are pushed up nearly half-way they will have to be tilted over the back of the frame.

Since the frame is in contact with the ground it must be given good protection. Bituminous paint is the best protective, though the lights should be painted white with a good white lead paint.

APPENDIX

INSPECTION AND MAINTENANCE CHARTS

A house is like a human being in that prevention is better than cure—and cheaper. A small defect neglected may in time cause serious and extensive trouble. To assist the householder in keeping his property in good condition the accompanying charts have been prepared showing the chief points which need watching, the most common small defects, and items of regular maintenance.

Some things, such as oiling hinges, need frequent attention, but in addition the householder should devote some time each year to house maintenance and repair—making a careful and thorough inspection, and giving a few week-ends or a week's holiday to the actual repairs. This should cover all the small items which are not usually noticed in the early stages, and is quite apart from any obvious defects which should be put right as soon as they occur.

When inspecting the structure study these charts and the lists of items. They will call your attention to many things which you would otherwise miss.

The Charts

Exterior Chart

This chart shows a typical house with brick walls and a pitched roof. But it will serve our purpose even if your house walls are of stone, concrete, or have a rendered surface, and whether your roof is tiled or slated, or even if it is flat.

Walls. Re-point any decayed joints after cutting out any loose or cracked pointing. Cut out any decayed bricks or stones and make good either with new brick or stone or with cement mortar. (See Chapter VI for details.)

Check the ground level in relation to the damp-proof course, and if the ground has been dug to bring the soil close to or over the damp-proof course shovel some of it away. (See p. 19, Vol. I.)

Efflorescence, showing as a white deposit on a wall surface,

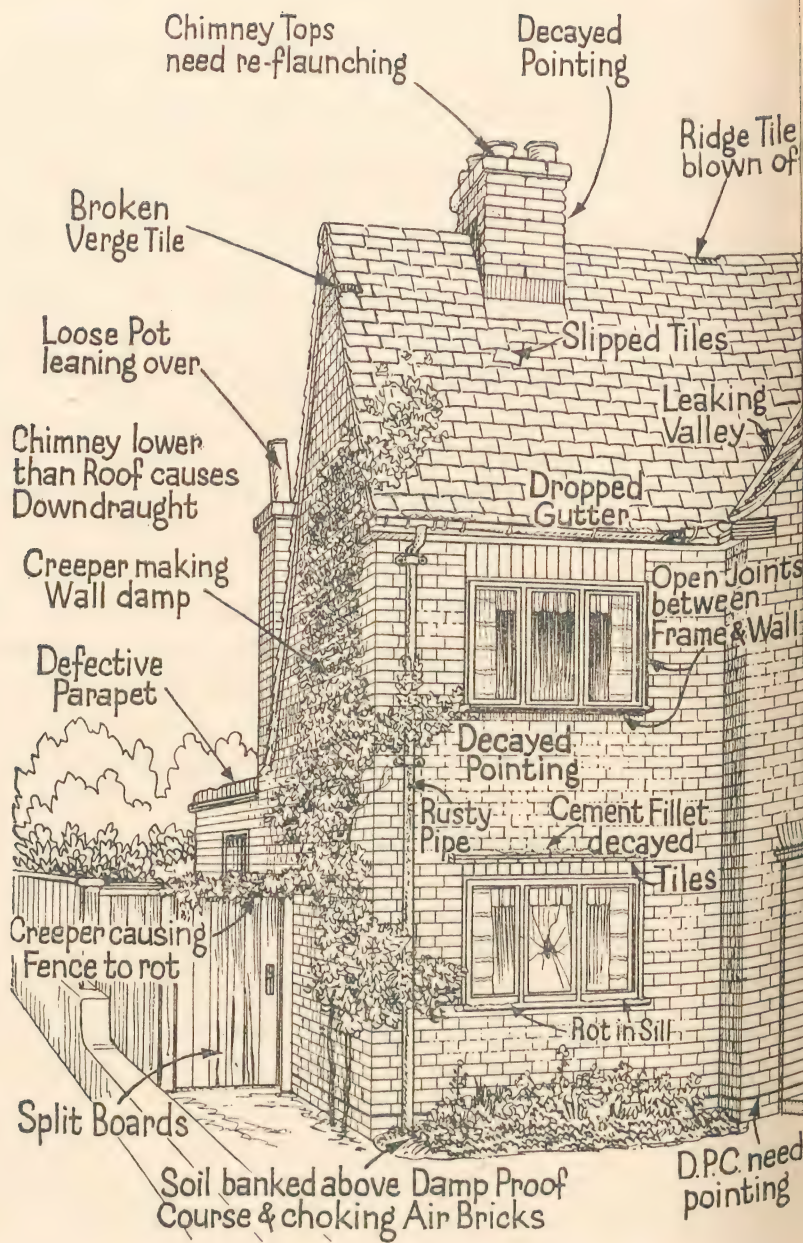
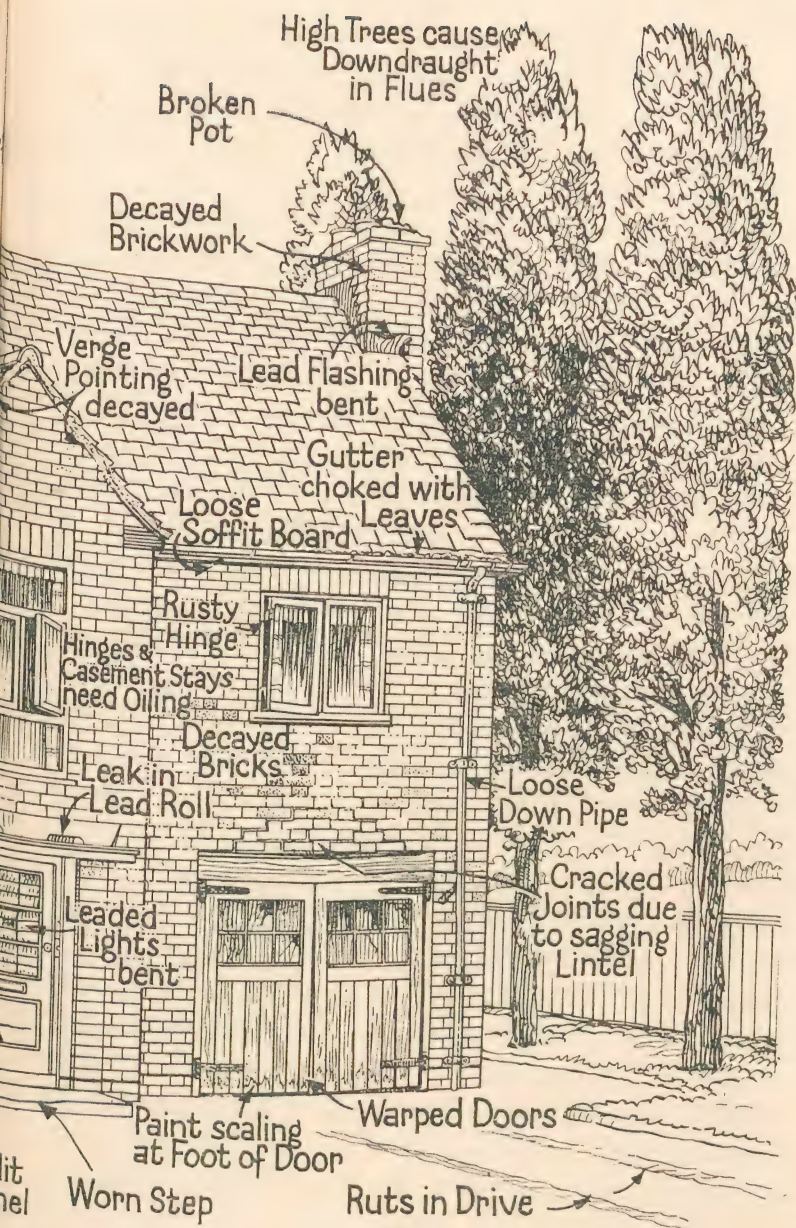


FIG. 1.—THIS SHOWS MANY OF THE DEFECTS IN THE EXTERIOR STRUCTURE IF NEGLECTED



CH SHOULD BE LOOKED FOR. THEY ARE TRIFLING TO START WITH BUT TO DECAY

should be brushed off with a stiff bristle brush every time a thick deposit appears. This will prevent the salts being re-absorbed into the wall and gradually reduce the trouble.

Outside pavings develop defects such as loose bricks or slabs, cracked slabs, crumbled joints and dusting up of concrete surfaces. Check over all types and make good as necessary.

Steps may need re-pointing or loose bricks or stones removed and re-set in mortar.

Sills may become loose or develop cracked or decayed joints.

String courses and other projections catch rainwater and should be examined for decayed joints and other faults. The top surface should have an outward slope or be flashed with lead. (See p. 104, Vol. I.)

Windows on the exterior may develop defects owing to weather action. Check over the joint between frame and wall. This is usually covered with a beading which may rot. Any gap should be filled with mastic. (See p. 157, Vol. I.)

The puttying of glass should be examined. Any cracked portions should be cut out and made good to prevent rain penetration.

External doors, gates and fencing being exposed to the weather should be checked over for signs of rot, warping, rusting of iron fittings and nails, and displacement. Dig out the ground around posts to a depth of about 9 in. and thoroughly soak the wood with preservative—this should be done at least once a year. (See p. 198, Vol. I.)

Any split or decayed boards or rails in fencing should be removed and new ones fixed. If boards are loose through the rusting of nails, re-nail throughout, using galvanized or copper nails.

Paintwork should be thoroughly examined. Even after a few months paint may develop slight defects such as blisters. Scrape these off, clean and spot paint two coats to make good the defects. If the paintwork is in good condition but looks dull it is worth a coat of best quality outside varnish. If badly discoloured but otherwise sound one coat of good gloss paint or outside enamel will restore it.

Rendering, if any, should be carefully examined, especially if it is old lime mortar rendering covered with oil paint. The paint film must be maintained intact. Any crumbled spots should be cut out, made good and re-painted.

Modern cement rendering may develop fine crazing and

stains—a coat of cream cement paint will freshen up the appearance. Look for deep cracks, which should be widened and undercut and then repaired. (See pp. 75–78, also Vol. I, p. 139.)

Parapets being in a very exposed position should be periodically examined and the pointing made good if it decays—also any soft bricks which may be crumbled by frost action should be cut back and the gap rendered with cement mortar or the brick cut out and a new one inserted. Stone parapets should be similarly treated.

The back of a parapet above the roof is not seen from below, so examine it from a ladder. In many cases the wall here decays badly without being noticed. Pointing and flashings should be carefully checked.

Eaves should also be examined from a ladder. If of the open type with the feet of the rafters exposed, check the wall filling between the rafters as birds can enter gaps, which also admit draughts and rain to the roof.

If of the boxed type check the soffit and fascia boards which may become loose through corrosion of the nails. Check the paintwork too.

Eaves gutters are liable to be stopped up with leaves and dirt, and should be examined in spring and autumn, especially if there are trees near. Clean out the gutters and make sure that the outlets are clear. These should be protected with wire balls. Check the falls, remembering that the water should run clear to the outlets. Use water to test this—pouring it in at the highest points of the gutter. Clean off any rust inside the gutter and coat with bituminous paint; see pp. 52 and 58. (Rainwater pipes are included under Plumbing, p. 238, Vol. I.)

Box gutters and gutters behind parapet walls should be examined. As these are usually lined with lead look for cracks and leaky welts.

Roof coverings should first be examined from the ground when slipped tiles or slates or decayed patches of thatch may be noticed. Then examine the roof on each side from a ladder and note the condition of ridge and hips. Clay ridge and hip tiles may need pointing or even re-bedding. Examine the hip irons which hold the hip tiles at the foot of the hip. If they are loose the screws may be rusted. If rusty give two coats of bituminous paint after cleaning.

Flashings may look quite sound from the ground, so they must be examined from a ladder, though it may not be possible to reach all the chimney flashings. Note the condition of the pointing around the flashings. If allowed to decay this may admit water behind the flashings. If possible clean any leaves and dirt from the small gutter at the back of the chimney. If inaccessible this may be reached by using a long stick.

Flat roofs should be checked over, noticing any cracks however fine, which can be repaired with mastic. (See p. 129, Vol. I.) In sheet roof materials the seams, welts, rolls and flashings should be carefully examined. If the window cleaner uses a flat roof to reach upstairs windows he may have damaged the joints.

Roof glazing and skylights should be checked. If the bars are of the puttyless type, see that the lead cover strips have not curled or lifted. If of the putty type examine the puttying for cracks. Check the flashings around roof lights and the ridge covering. If the glass has not been cleaned for some time use warm water with a little soda added.

Snowguards fixed at the eaves to prevent snow falling on glass verandahs or other glass roofs below should be carefully checked for looseness and corrosion of fixings. Re-paint if there is any sign of rust.

Roof tanks for collecting rainwater should be emptied and cleaned out at least once a year in the country and twice in town. Take care in cleaning the outlet, which should be protected with a wire ball. Check the seams and also the outer structure.

Chimneys should be examined as closely as possible as serious defects may exist and yet not be noticeable from the ground. Pointing and flaunching (see Chapter XII, Vol. I) are especially important. Any cracks in the chimney pots should be noted. Usually a builder must be called in for repairs owing to the height.

Dampness is often due to exterior defects, and if any has appeared inside this should be borne in mind in making the exterior inspection. (See Chapter II, Vol. I.)

Interior Chart

The Interior Chart shows a typical living room with defects which might occur in any house which has been rather neglected.

Although the defects are well developed most of them can be detected at a much earlier stage and many can be prevented by regular maintenance. In most of its details this chart can be used as a guide in inspecting other rooms in the house.

Floorboards. Most boarded floors soon warp so that the edges curl up. Plane down these edges. Wide shrinkage gaps should be noted and filled. (See p. 120, Vol. I.) Look for loose nails and punch them down. Re-nail loose boards. Look carefully for signs of rot. On the Chart a small patch is shown near the wall—due to the damp soaking through the wall. Examine the wood margin round the hearth and re-nail if it is loose.

Skirtings shrink away from the floor (see p. 120, Vol. I) and also may become loose owing to shrinkage of wood plugs used in fixing. A short length such as that at the side of the chimney breast in the Chart is often not securely fixed and the corner mitre springs open. Another defect to look for is the unsightly gap between back of skirting and plaster face, which may be due to faulty fixing or to looseness. This can be remedied just before re-decorating, and if it is impossible to drive the skirting back the gap can be closed with adamant or other hard plaster.

Fireplace. There are four separate parts: tiled surround and hearth; firebrick back and sides; iron grate and front; mantel-piece. Examine them separately. Note any cracked or loose tiles, cracks or loose parts in the firebrick interior, fractured iron parts of the grate, and the condition and fixing of the mantel-piece. (See pp. 313 and 332 for repair details.)

Note any tendency to down-draught. If you have only just taken over the house you may not discover this at once, as the tendency may only exist with the wind in certain quarters. (See p. 147, Vol. I.)

Chimney sweeping should be done at least twice a year if the grate is in regular daily use. A chimney with a tendency to down-draught may have to be swept much more frequently.

Plaster walls and ceilings. Examine carefully for cracks. If the decorations are old fine crazing will be noticeable, but this is not a serious matter and will be concealed by re-decoration. But cracks should be treated without delay. (See pp. 75-78, also Vol. I, p. 139.) Plaster sometimes becomes loose in patches, and this can be detected by the hollow sound when knocked.

Picture rails should be tested by pulling at intervals of a yard.

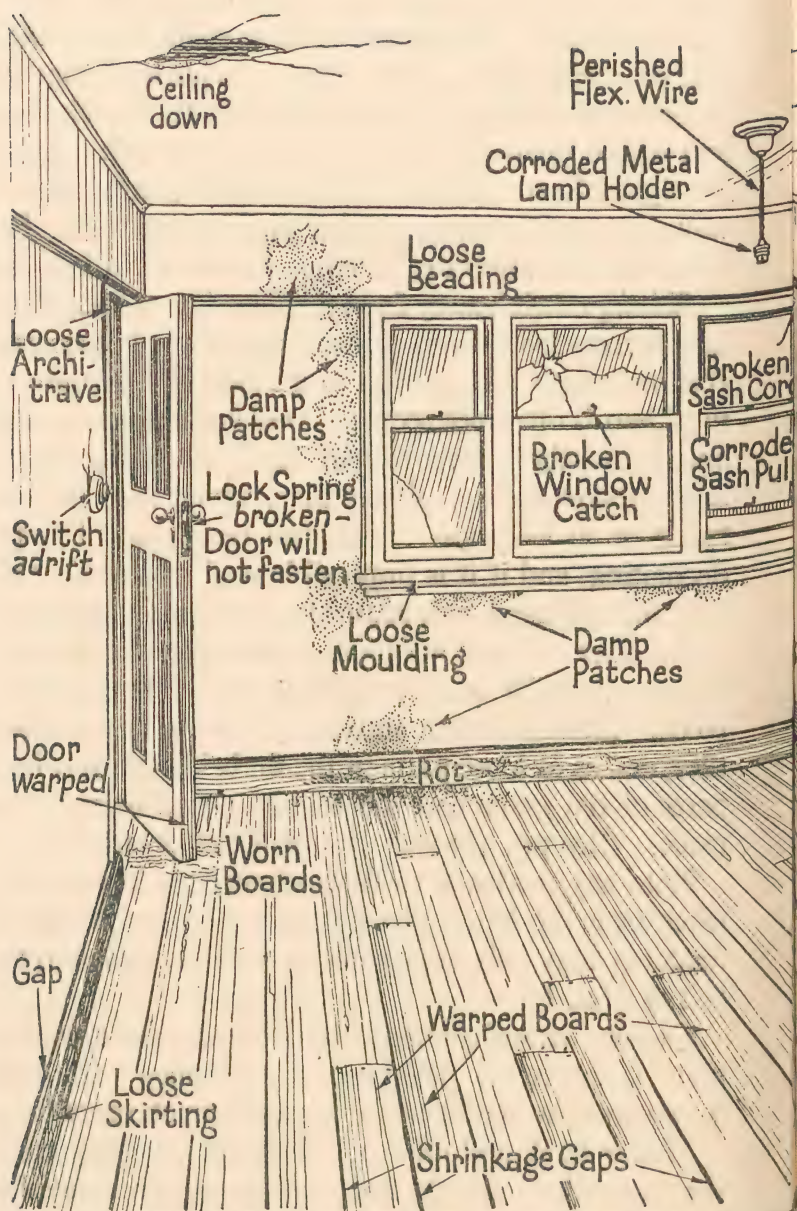
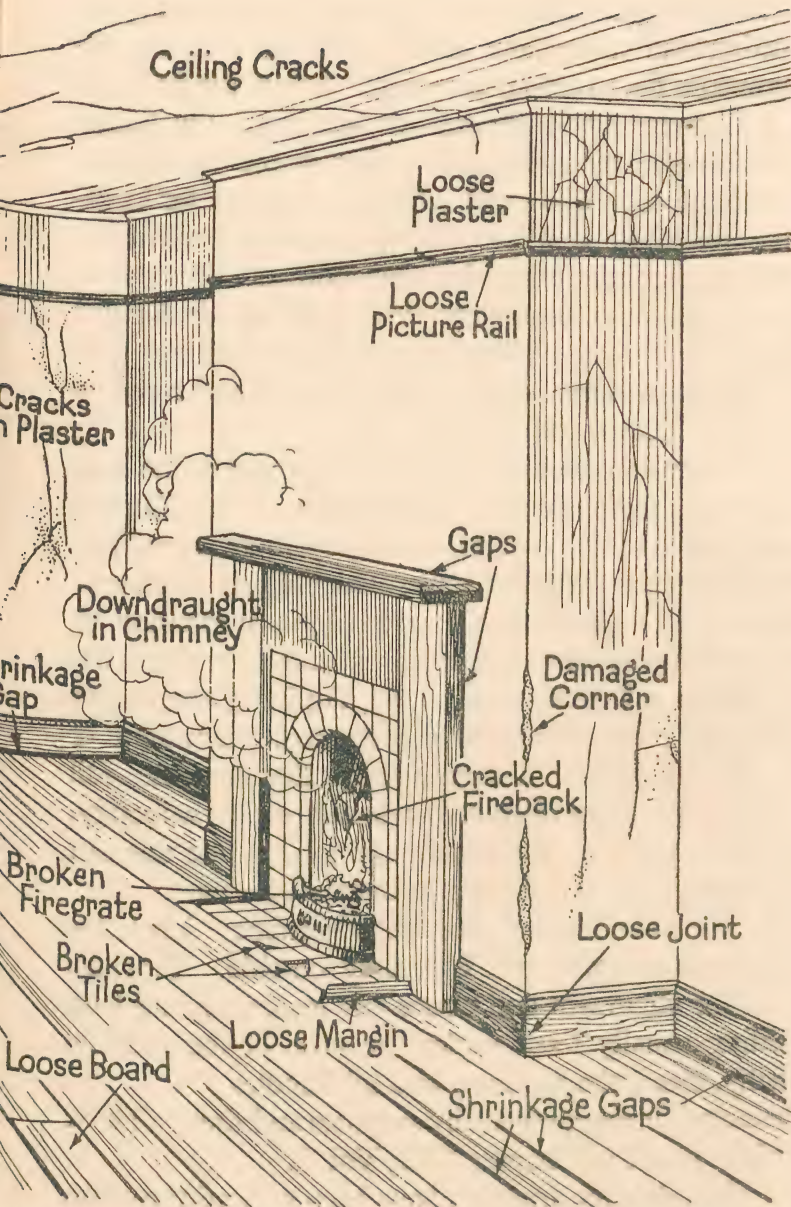


FIG. 2. A LIVING ROOM WITH DEFECTS WHICH HAVE BECOME SERIOUS
THE EASY



OUGH NEGLECT. BY PERIODICAL INSPECTION YOU CAN CATCH THEM IN
ES

Note any open mitres at corners and gaps between back of rail and plaster. Loose rails must be re-fixed by plugging. (See p. 181, Vol. I.)

Doors and door linings. Check the working of the door, opening and shutting and notice any tendency to bind or for the bottom to scrape on floor or floor covering. Check the fit in the door lining and notice any wide gaps or warping. Oil hinges four times a year and oil locks and latches at the same time. Check alignment of door lining and architrave and test for looseness. A common fault is a gap between back of architrave moulding and plaster face. Examine door both sides for cracks and loose joints. (See pp. 20 and 170, Vol. I, for repair details.)

Door furniture and locks. Test locks and latches and note condition of door furniture. Looseness of knobs and levers is a common fault. (See p. 176, Vol. I.)

Windows. The window shown in the Chart is a triple sash window with cords, pulleys and counterweights. (See Kitchen Chart for casement window.) The sash type window should be very carefully inspected for slight faults which if neglected may cause serious trouble. As the sashes are held in suspension by the cords and counterweights test the cords, and if they look old or are frayed replace with new. (See p. 163, Vol. I.) This is better than waiting until a cord breaks. If only one cord shows signs of wear replace the whole set. Examine the pulley sheaves. Oil them, and if they are stiff or distorted or do not revolve smoothly, replace with new, which is quite a simple job. Take one out for a sample and ask the ironmonger to match it for size.

Check over the sash frames and the box frame. Look for loose beading and signs of rot, especially outside. Test the window board for alignment and notice any looseness, and look at the moulding usually fixed under the nose of the window board. Finally, check the fasteners and lift handles.

Check the *electric fittings*, especially switches and fires. These are dealt with in detail in Chapter XXI, Vol. I.

Draught. If unpleasant draughts have been noticed the cause should be traced systematically. Notice how the fire burns. If it burns very rapidly with a swift up-draught (and this is often found where the flues are long and straight) it may be possible to reduce the air passing through the fire, and, therefore, the draught entering the room, by reducing the air inlets under

the fire. If the grate is large it may be reduced in area by adding firebricks.

Examine doors and windows for gaps. Though a certain amount of air is necessary for proper combustion in the fire the gaps can be reduced. The aim should be to reduce or stop gaps which allow air currents to pass across the room through the areas where the chairs are usually placed.

If the hall entrance door is exposed to strong winds it may be possible to erect a porch or screen which will have the effect of reducing draughts. Careful intelligent observation is necessary to find the source of the trouble and suggest remedies. (See p. 345 for details.)

Floor ventilation. Wood floors must be ventilated underneath to prevent dry rot, as described in Chapter VII, Vol. I. The ventilation should be checked at least once a year. The ground may have been dug to cover air bricks, or dust and mud may have choked the vent holes, so see that the vents are unobstructed. See that there are air bricks on both sides, allowing a through current of air. If not add air bricks in suitable positions.

Dampness. Look for signs of damp. The most common sign is discoloration of wall or ceiling decorations. In tracing the cause remember that damp may travel some distance through the structure before it reaches the interior wall or ceiling linings. (See p. 23, Vol. I.)

Kitchen Chart

The kitchen is shown without furniture or built-in cupboards, and in this connection illustrates the difficulty of arranging loose furniture and fittings conveniently. It is now recognized that the kitchen should be planned and equipped as a complete working unit. If it is intended to remodel the interior of the house the provision of built-in fittings in the kitchen should certainly be included, and they should be carefully planned to reduce fetching and carrying to a minimum.

Lighting is very important. The working table, the sink and draining-board and the interiors of cupboards and ovens should all be well lit, both by daylight and artificial light. In the Chart the small window shown is inadequate by modern standards, and it would be desirable to have a new window fixed on the

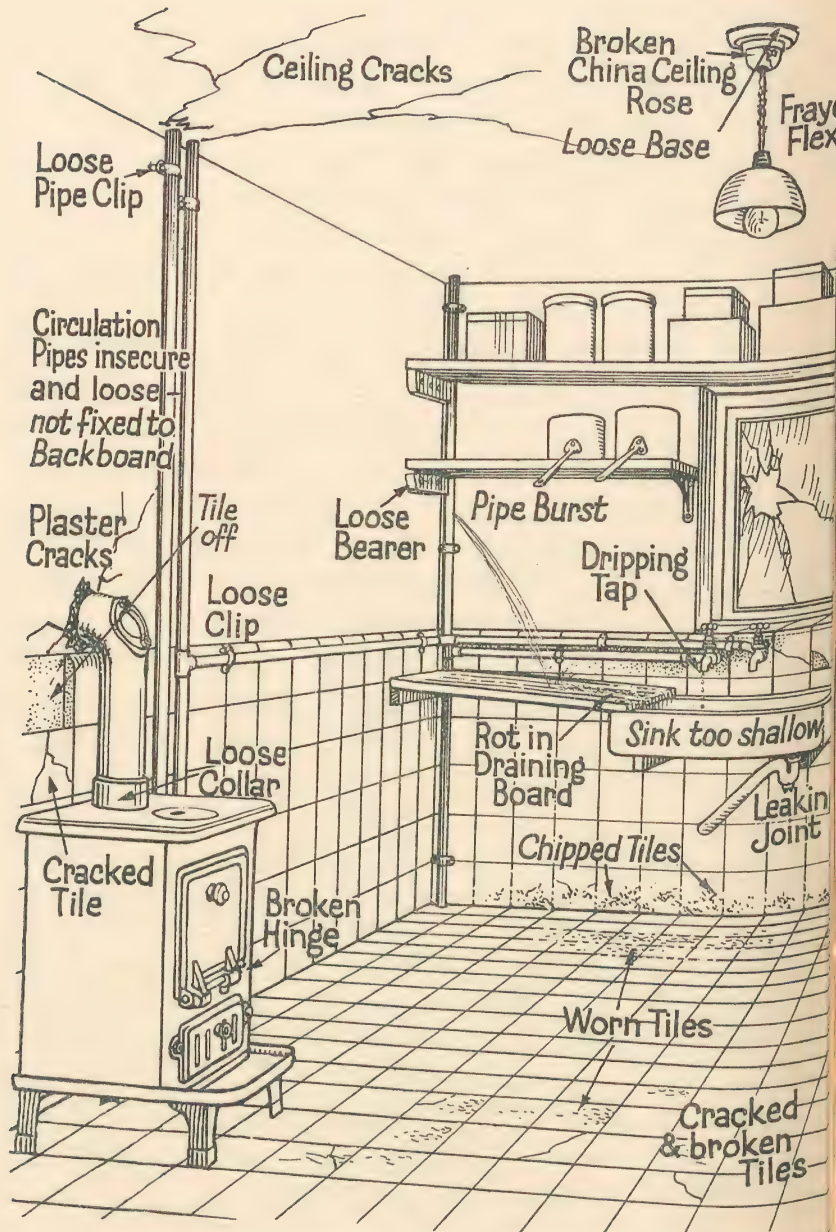
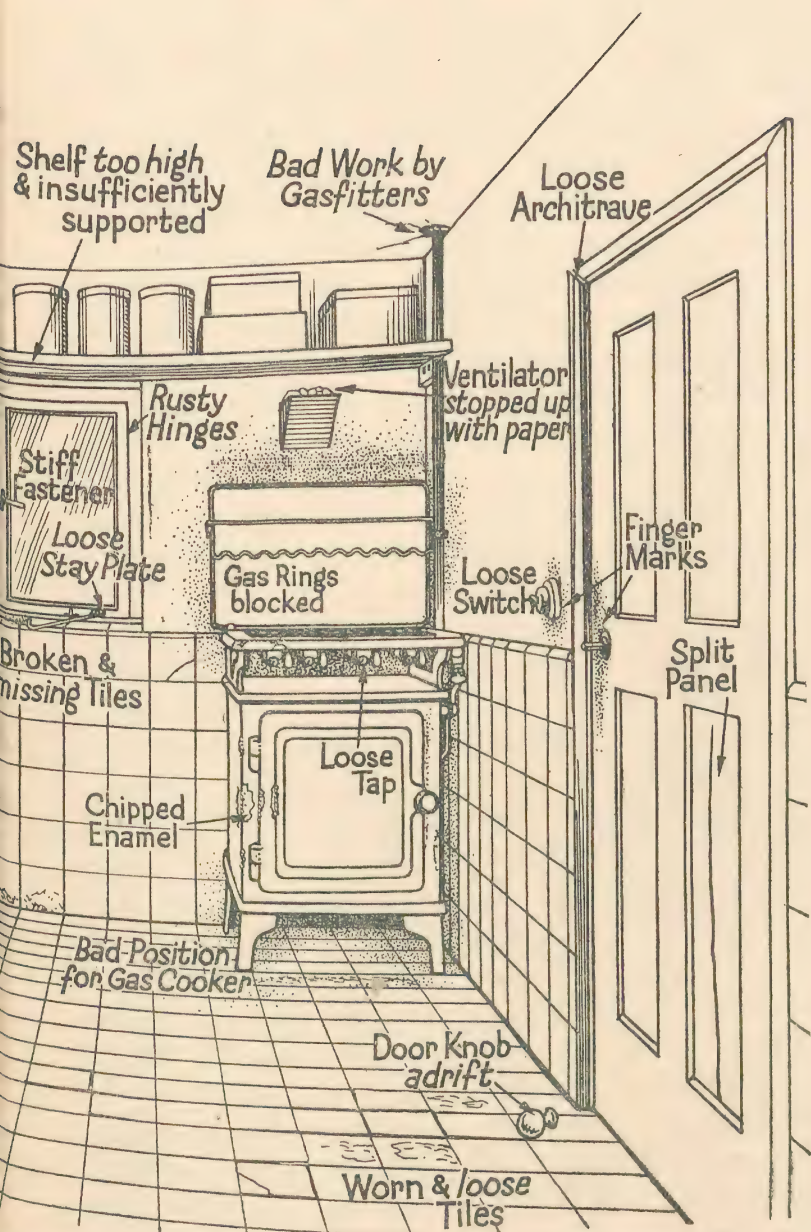


FIG. 3. HERE ARE SOME TROUBLESOME DEFECTS YOU MAY FIND IN AN OLD OR UNFIT KITCHEN



KITCHEN—SOME PERHAPS NOT OBVIOUS UNTIL YOU LOOK FOR THEM,
THEY DEVELOP

left side wall. This would give a better distribution of light, but the widening of the existing window opening would also be a great improvement.

In addition to the existing central ceiling lamp there should be a small wall lamp over the sink and in any other working position where a shadow is cast from the central lamp.

Floor tiles. Typical defects are illustrated in the quarry tile flooring. Check the whole floor for cracks, loose tiles and worn tiles. Treatment is described on p. 330. Regular maintenance should consist of washing with ordinary soap and water. A quarry tile floor should never be scrubbed as this will roughen the surface. Occasional treatment with linseed oil will keep the surface in good condition by preventing abrasion. If desired a special tile polish may be used. An old worn floor should be regularly treated with a proprietary red tile polish.

Wall tiling—Check over for cracks, loose tiles, chipped glazing and crazing. Tiles near the independent boiler may be loose owing to the heat. Tiles near the sink may have been damaged by buckets, etc. (See p. 333.)

Plaster. Check over for cracks and crazing as already described in the living room. Cracks sometimes start from pipe holes.

Doors. Check opening and closing, alignment, fit and condition of door linings and architraves. Check the locks, hinges and door furniture. The loose knob illustrated is a common fault. Oil hinges and locks at least three times a year, as steam and condensation quickly affect the moving parts.

Windows. Check the opening casements, hinges and fittings. (For sash type windows see the Interior Chart.) If the opening casements bind plane the edges as necessary and then give three coats of paint. If the wood is left bare moisture will enter and the casement will swell. (See p. 28, Vol. I.)

Steel windows and iron fittings must be well protected in a kitchen, as steam and condensation quickly corrode bare metal. Check for paint faults such as blisters and rust spots, however small. Scrape down to the bright metal and touch up with three coats of paint.

Fasteners and casement stays may become loose, so check the screw fixings of the plates and tighten if necessary.

Shelves have to take heavy loads in a kitchen and the brackets

are not always strong enough, though more often the fixings to the wall are inadequate. In the Chart the top full-width shelf is supported at each end on wood bearers and has deflected under the load. This shelf needs two intermediate brackets. Always use fibre plugs to make the screw fixings.

The result of a weak bearer fixing is illustrated in the short shelf over the draining board. This should be re-fixed, using fibre plugs.

Test all fixings and brackets by pulling them outwards, which will reveal any looseness.

Decorations. Check the condition of the wall and ceiling decorations. If there is much flaking it is probably due to the steam and condensation, which particularly affects distemper. A flat oil paint is best for a kitchen. It can be scrubbed if necessary. A glossy oil paint though easily cleaned is more likely to assist condensation.

For the doors use enamel paint of the best quality. The finger-marks illustrated in the Chart could, of course, be avoided by fixing a finger-plate.

Electric and gas fittings. Check these for the small faults which easily develop, including loose bases, loose taps, burnt switch contacts, worn flex and corroded metal lampholders. (See Chapters XXI and XXII, Vol. I.)

Electric cookers should be dismantled twice a year so that they can be checked over and thoroughly cleaned. The main switch must, of course, be put in the "off" position before doing this. In most electric cookers the sides, the top, the boiling-plates and the oven lining are removable. If the heating elements are cracked or otherwise damaged remove them and take them to the electricity showrooms and obtain replacements.

Gas cookers should be checked over in a similar way. If the taps are loose the small nuts should be tightened to take up the slackness. The ring, griller and oven jets are removable and these should be taken out and cleaned by soaking in hot water to which soda has been added, afterwards standing them on end to drain. Partially choked jets cause the gas to be burnt inefficiently.

Sink. The Chart illustrates a shallow sink, a type which is unfortunately still found in many kitchens. The water splashes

left side wall. This would give a better distribution of light, but the widening of the existing window opening would also be a great improvement.

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Sink. The Chart illustrates a shallow sink, a type which is unfortunately still found in many kitchens. The water splashes

over such a sink. It is well worth the cost to replace it with a deep Belfast type sink. Examine the draining-board.

Examine the sink fixing. If it is supported on brackets check for looseness. Sink brackets are built into the wall. A loose bracket should be re-set with cement while the sink is temporarily supported, and this support should not be removed for at least four days so that the cement can set hard.

Clean out the *sink waste* once a week. If the trap (the S-shaped bend under the waste outlet) has a screw cap at the bottom bend, unscrew this and the inside can then be cleaned. If the trap becomes choked access can be gained by removing this screw cap. Without a screw cap a flexible rod should be used so that it can be pushed through the bends of the trap. A coiled spring curtain "rod" is useful for this purpose.

Ranges and independent boilers. These should first be tested in use, making notes of any obvious faults such as slow heating of the ovens, slow heating of the circulating water from the boiler, and down-draught.

Then check the dampers. Notice if the fire draught responds properly to each damper. That is, for the oven the fire draught should be drawn through the oven flues, and for the boiler under the boiler. With all dampers closed there should be a steady but not quick up-draught direct to the main flue. (See Chapter XII, Vol. I.)

Check the oven door hinges, fasteners, knobs and all movable parts. Examine the grate interior for broken bars or fractured fireclay linings.

In the Kitchen Chart an independent boiler is shown with a pipe flue bend connecting to a brick flue in the wall. Some bends have no cleaning cover, and even with a cleaning door on the brick flue the pipe flue might be difficult to clean. Check the joints of the pipe flue both with the brick flue and the stove. Fill any gaps with a fire cement.

Ventilator. If the kitchen has an air brick vent with a draught deflecting cover, see that it is not stopped up. Some people stop them with paper if they cause draught. Any such draught should be dealt with by adding further deflecting covers.

Cold and hot water supply are dealt with in the Plumbing and Bathroom Chart, described below. The fixings may be included here. Test each clip for looseness and add new clips if

necessary. Note any signs of joint leakage. Pipes on outside walls should be protected against frost. (See Chapter XVIII, Vol. I.) In the Kitchen Chart no back boards are shown. Their absence is a fault, as they improve the insulation as well as providing a convenient means of fixing.

Check the taps for fixing and leakage through worn washers.

Bathroom and Plumbing Chart

Sanitary equipment should be cleaned daily. The proprietary chemical sanitary cleansers should be used as they make the work much easier, especially in cleansing w.c. pans.

Waste outlets from sink, bath and lavatory basin should be cleaned frequently, as described for the sink outlet under Kitchen Chart. A partial stoppage through small pieces of soap entering the waste outlet should be tackled without delay as it harbours grease and dirt. Flushing with hot water and disinfectant is the best means of removing this debris.

Soil and waste down pipes on the outside of the wall are not so likely to stoppage as the drains underground. A big object such as a scrubbing brush may lodge at the junction of the w.c. branch with the soil pipe. Special coil spring rods are made for the purpose of reaching such obstructions. They can be passed through the bends of the trap.

Rainwater and waste heads should be cleaned out every month or so, otherwise leaves and dirt may choke the outlets. Rainwater gutters should also be regularly cleaned out as indicated in the Exterior Chart.

The joints of waste and soil pipes should be sealed. Lead caulking is used for this purpose, but expansion may cause the joints to open. In a vertical pipe this will not cause leakage of liquids but it will allow foul gases to escape. The lead caulking can be tightened up by tamping with a blunt chisel or thin iron bar and hammer. A proprietary jointing composition may be used to fill up large gaps.

The fixings of waste, soil and rainwater pipes should be checked. If they are loose remove the nails and refix, using fibre or metal plugs and round-headed screws—the screws should be galvanized or painted with bituminous paint. Check also the fixings of rainwater and waste heads and shoes.

Dished ways taking the waste water from sinks, and gully

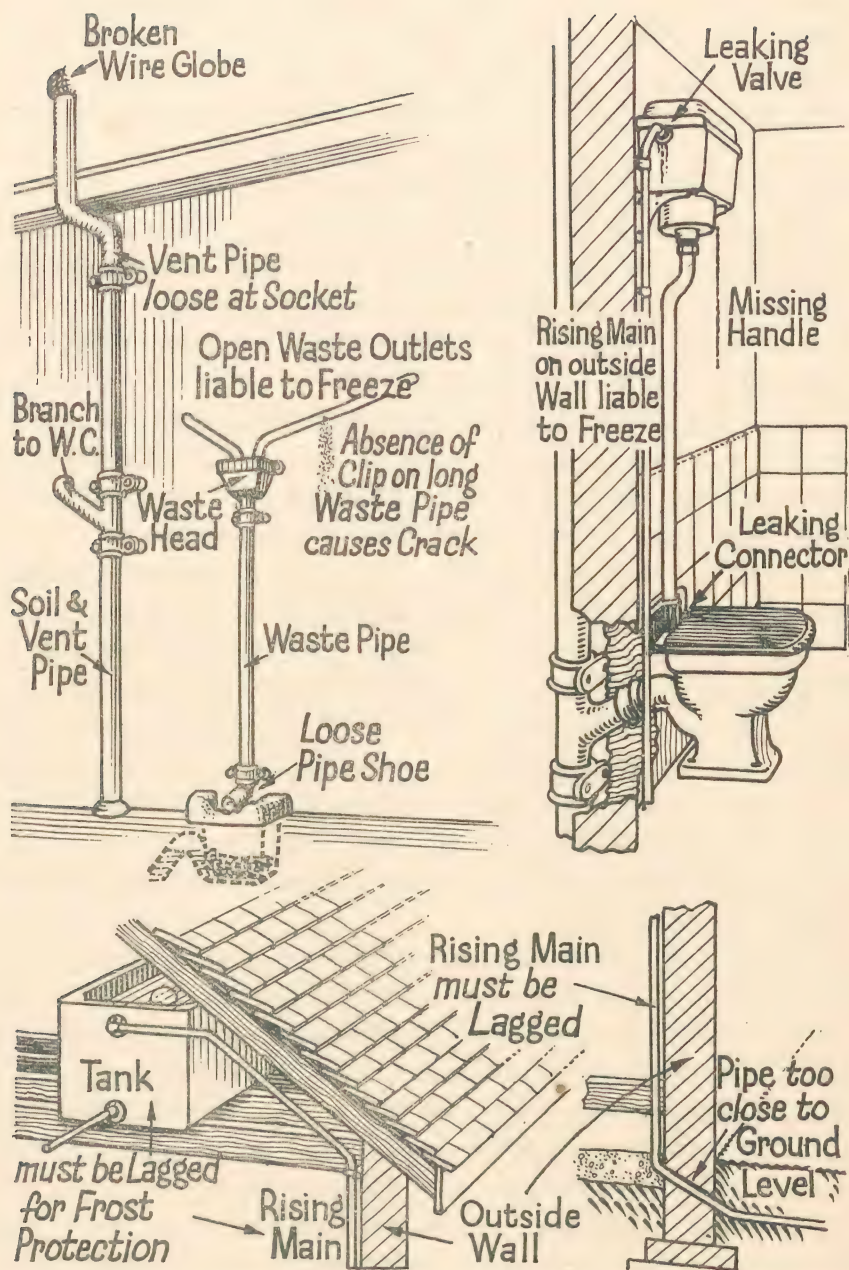


FIG. 4. LOOK FOR PLUMBING DEFECTS SUCH AS THESE AND DO SOMETHING BEFORE THE SEVERE WEATHER COMES

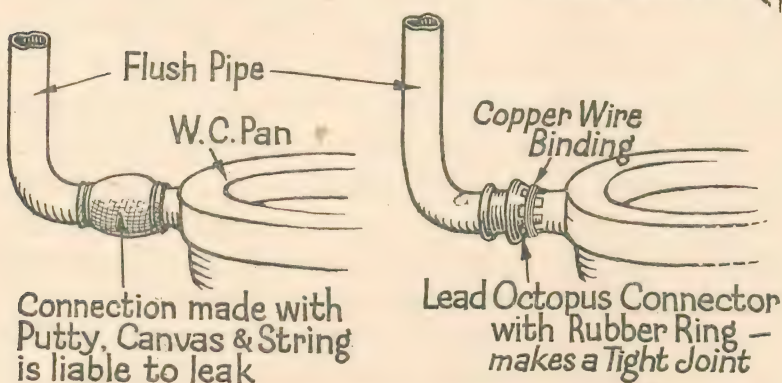
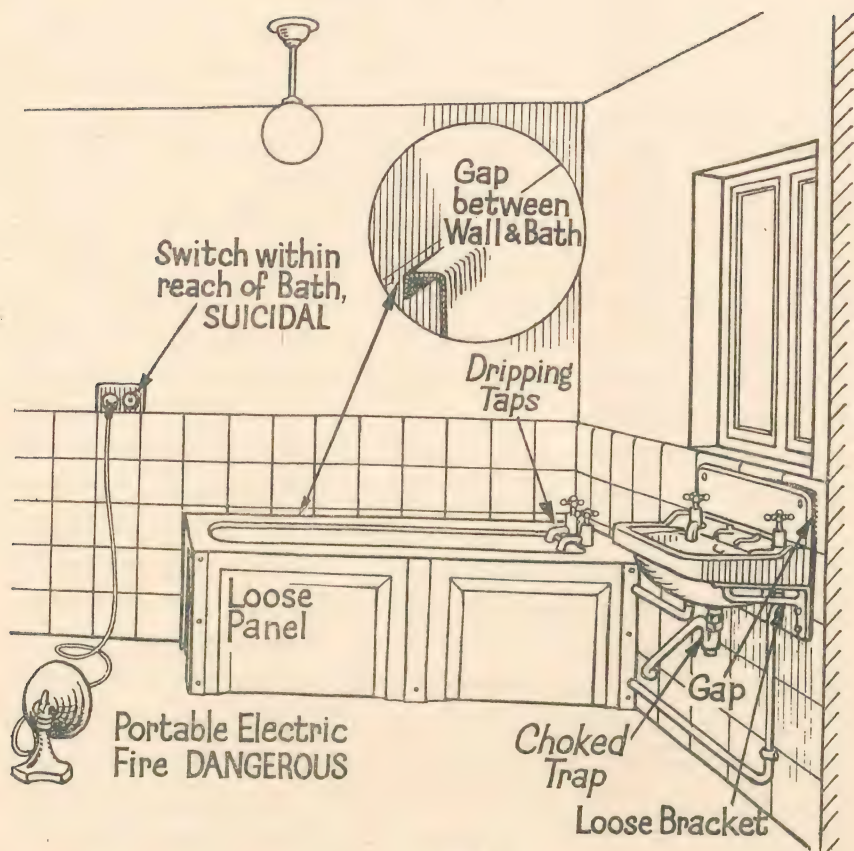


FIG. 5. THESE DEFECTS ARE TRIFLES AT FIRST AND EASILY REMEDIED

curbs, should be examined, and any breakage made good with cement mortar or fine concrete.

Gully grids and traps should be cleaned out every week or two. Remove the grids and wash in hot water and disinfectant. A spoon ladle is the best tool for cleaning out the trap. Some gully traps are fitted with mud buckets which have a protruding handle. These should be lifted and emptied.

Underground drains do not normally need regular attention. (See Chapter XX, Vol. I, for drain stoppages.)

Fresh air inlets should be cleaned about four times a year. Use a thin stick to clear the air holes or grid. Some inlets are fitted with mica flaps so that if the draught is reversed the flap closes and foul gases cannot escape. By poking a stick through the vent holes or slits the working of this flap can be checked. It should swing freely.

Vent pipes should have a galvanized wire ball fitted at the head to prevent debris entering. If this is corroded a new one should be fixed. At the same time pass a rod down the pipe to make sure that it is not choked.

For details of drainage, see Chapter XX, Vol. I.

Bathroom fixings should be checked. Test the lavatory basin brackets, and if they are loose refix, using fibre plugs and galvanized screws. Examine the fixings of bath panels and w.c. cisterns.

Gaps around the bath should be closed as they admit dust and water. The gap often found between the bath rim and the wall should be closed by adding a hardwood beading, bedding it in white enamel or paint. Loose bath panels should be tightened or re-fixed.

Pipe fixings should be checked, any loose pipe clips being re-fixed with fibre plugs and chromium-plated or galvanized screws. If pipes have insufficient clips new ones should be added. This is particularly important with horizontal or diagonal runs of piping which may sag and crack if not properly supported, and the sagging may set up air locks.

W.C. cisterns. Check the flushing. The cistern should discharge the water quickly and re-fill within two minutes. The valve should close evenly, and when the ball arm is at full height the valve should close tightly allowing no more water to enter. If it leaks it is either out of adjustment or needs a new washer. (See Chapter XVIII, Vol. I.)

If the ball arm fails to rise with the water the ball is probably punctured—though check the arm first to see that the valve has not stuck. To repair a punctured ball remove the ball and arm, which unscrews, turn the ball round until the hole is revealed by escaping water, then clean a patch round it and repair by soldering, taking care to empty it of water first.

Check the water level in the w.c. cistern, which should reach when full to within a fraction of an inch of the overflow pipe. If the valve does not close before the water reaches the overflow outlet bend the ball arm down slightly taking care not to overdo it or it may break.

Flush pipe. This may leak either at the cistern outlet or the joint with the w.c. pan. Examine both joints for signs of leakage. The joint with the pan is often a very poor type, consisting of putty covered with canvas and tied with string or wire. The putty is liable to shrink and cause leakage. Remove the putty and buy a lead "octopus" or other metal joint—they are simple to fix.

The w.c. pan and joint with the soil branch or drain should be examined for defects. A pan cracked or chipped inside should be removed and a new one fitted. The outlet spigot and socket joint should be carefully examined as any leakage will allow smells to escape. This is a cement joint. (See Chapter XVIII, Vol. I.)

Cold water supply. Check this over from the point where the service pipe enters the house (usually in the kitchen) through its various branches. There should be a stop tap in the rising main by which the supply can be cut off from fittings, as well as an underground stop cock in an iron box just outside the front or other boundary of the property.

Check all joints for signs of leakage and check fixings as already mentioned.

Frozen pipes. Consider the possibility of water freezing in the pipes, especially if you have just taken over the house. Pipes on outside walls and in roofs are particularly vulnerable and should be lagged. (See Chapter XVIII, Vol. I.)

Cold water tanks in the roof should also be lagged and a thick wood cover should be placed over any open tanks.

Temporary precautions against freezing are necessary at the approach of winter. Tie sacking or straw around open rain-

water and waste heads, and in exposed positions lag all waste and soil pipes with sacking. Outside water pumps should be lagged with straw or thick sacking. Outside stop-cock boxes should be packed with straw or sacking.

Water hammer. If when a tap is quickly closed or a ball valve closes a loud chattering noise is heard in the water pipes accompanied by vibration of the pipes, especially marked if they are of galvanized iron, this is the trouble called water hammer.

This is caused by the concussion of the water on the valve washer or jumper, and it is particularly liable to affect a ball valve in a w.c. cistern or a cold water feed tank—the valve jumper moves up and down and the ball arm is forced up and down in unison. On an ordinary tap the same effect is produced if there is any looseness in the valve jumper or washer.

In mild cases the trouble may be remedied by fixing new valve jumpers and washers which leave no slackness. But the only certain cure is to have an air vessel fitted as an extension of the water pipe above the ball valve. Water is not compressible, but air is, and so the air vessel acts as a buffer which absorbs the concussion. This is a plumber's job.

In bad cases the concussion produced by water hammer may fracture the pipes.

Air lock. To test for air lock open the taps, in turn, and if no water comes or if the flow is intermittent air lock is indicated. This occurs through a pipe being fixed level or perhaps with an upwards incline and then a downwards incline, as across a wall, and the air brought with the water collects at the highest points in the horizontal pipe run. This happens especially when a horizontal pipe sags between the fixing points. So much air collects that the water pressure may not be sufficient to force the water along.

The pipe should be straightened and properly supported, and the best way to support a horizontal run is to fix a length of wood under.

Hot water system. Check the actual working of the system, including the cold water feed. The only test which the householder can make is to notice how the system works. Does it give adequate hot water without undue delay or excessive fuel consumption?

Apart from an inherently faulty system, a common fault is

lengthy runs of circulation piping through cold rooms and halls, resulting in considerable heat losses from the bare pipes. The remedy is to lag the pipes.

Details of hot water systems are described in Chapter XIX, Vol. I, but repairs should be dealt with by a skilled plumber.

Sluggish circulation may be due to the furring of pipes and boiler by lime salts deposited by hard water. But only a plumber can deal with this.

If the hot water is a rusty colour interior corrosion of galvanized tanks and pipes is indicated. In some cases where copper pipes are connected to galvanized iron tanks the corrosion may be caused by electrolytic action between the two metals.

Chipped sanitary fittings. Examine both inside and outside of baths, lavatory basins and other enamelled fittings. If the enamel is chipped make good with good quality bath enamel.

Floor. Examine the bathroom floor for signs of rot or soaking from water splashed on the floor or dripping from cold surfaces (condensation). Replace any rotten wood and cover the floor with rubber flooring fitted tight to the skirtings and equipment. (See p. 324.)

Wall coverings. For tiling and plaster, see Kitchen Chart.

Doors and windows. See under Kitchen Chart. Examine steel windows and iron fittings for signs of rust, which should be attended to at once as steam and condensation will rapidly corrode unprotected metal.

Locks and fittings. Check working, and oil every three months to combat steam and moist air.

Gas geysers. A gas geyser or multi-point heater should be maintained according to the manufacturer's directions. Usually a copy can be obtained on application to the maker, and the directions regarding use and cleaning should be carefully followed.

A gas stop tap and a water stop tap are, or should be, provided to enable supplies of gas and water to be cut off when the fitting is being attended to.

Check the flue as persistent down-draught may fill the bathroom with poisonous fumes. Unless connected to a brick flue a geyser is usually connected to an asbestos-cement pipe flue, and there should be a special terminal at the outlet in the open air designed to prevent down-draught. Some form of baffle is

fitted immediately above the geyser, and it is possible to check the working of the flue by holding a lighted match or candle to the air opening of this baffle. If the flame is blown backwards or sideways down-draught is indicated. If it burns steadily the flue is working properly.

If the geyser is faulty in any way, consult a plumber or the local gas department.

Electric fittings. Check switches and lighting points as described under Interior Chart.

Ordinary electric fires, especially of the portable type, are dangerous in bathrooms. Moisture may affect the insulation, and if the metal outer parts become "live" and are touched with a wet hand fatal results may follow. There have been many fatal accidents through portable bowl fires falling into the bath from a chair or shelf. If you cannot have a radiator fixed in the bathroom have a special bathroom electric fire which is fixed high up the wall and controlled by a cord pull switch.

Oiling

Although the importance of oiling has been previously mentioned it is advisable to go through the house occasionally and oil all moving parts of fittings. These include: locks, latches, bolts, hinges, fasteners, window stays, sash window pulleys, and outside gate hinges and fasteners. Large pin hinges on gates and garage doors should be packed with lubricating grease or oiled with thick motor oil. For interior fittings cycle oil should be used.

As a guide, oil interior fittings in dry rooms twice a year. In kitchens, lavatories and bathrooms, and on outside doors and gates, oil four times a year. By regular oiling metal fittings will last for generations.

Do *not* oil electric switches, as the oil may reach the contacts and prevent the current passing through.

Maintenance Tools

A fairly comprehensive tool kit for carpentry, joinery and bricklaying, and general household repairs, should include the following:

24-in. handsaw.
18-in. handsaw.

12-in. tenon saw.
Padsaw with blades.

Firmer chisels, $\frac{1}{4}$ -in., $\frac{3}{8}$ -in., $\frac{1}{2}$ -in., $\frac{5}{8}$ -in., 1-in.	Pair of combination pliers.
Firmer gouge, $\frac{1}{2}$ -in.	Mallet.
Screwdrivers (turn screw), one large, one small.	Try square.
Screwdriver (electrician's) in- sulated handle.	Sawset and saw file.
Bradawl.	Nail punch.
Gimlet.	Bricklayer's hammer.
8-in. spirit level and plumb.	Trowel, medium size.
Plumb line and board.	Pointing trowel.
Carpenter's hammer.	Plasterer's float.
Claw hammer.	Bricklayer's line and pins.
Engineer's ball hammer.	Straight-edge, 4-ft.
Boxwood rule, 2 ft. 4-fold.	Glass cutter.
50-ft. measuring tape.	Oil can.
Adjustable wrench.	Rawlplug outfit.
Set of spanners.	Solder.
Axe.	Fluxite.
Steel plane, adjustable.	Soldering iron.
Ratchet brace and set of 6 bits.	Waterproof glue.
	Oilstone.
	Grindstone, revolving.

Nails and Screws

It is advisable to stock a fairly wide selection of sizes and types in small quantities rather than a few sizes in large quantities. Use judgment in selecting the nail or screw for the particular purpose. If, for example, you want to conceal the nail head use an oval wire nail and punch it down, then stop the hole with plastic wood or putty.

Keep nails and screws either in a large box divided into compartments or in separate boxes or cans clearly labelled. Pour a few spots of oil on the contents and shake them up so that each nail or screw becomes coated with oil. This will prevent rusting.

For outside use and damp positions stock a few rustproofed (sheradized or galvanized) nails and screws. Some brass screws should also be obtained.

Round wire nails, variety of sizes from $\frac{3}{4}$ -in. to 6-in.

Oval wire nails, variety of sizes from $\frac{3}{4}$ -in. to 6-in.

Cut steel floor brads, 2 $\frac{1}{4}$ -in.

Galvanized clout nails, $\frac{3}{4}$ -in. to 2-in. for fixing slates and roof felting.

Lost head oval brads, $1\frac{1}{2}$ -in. to 3-in.

Panel pins, $\frac{1}{2}$ -in. to 1-in.

Galvanized staples, $\frac{3}{4}$ -in. to 2-in.

Pipe hooks.

Corrugated saw-edged wood fasteners.

Steel wood screws, countersunk heads—sizes are denoted by length (there are 21 lengths commonly stocked, $\frac{1}{4}$ -in. to 6-in., but if you stock the smaller sizes, $\frac{1}{4}$ -in. to 1-in., plus a few of the longer sizes, these will meet most requirements). There are also numbers which denote diameter (Nos. 1 to 24), and in each length there are several available diameters.

Japanned round head screws—available in lengths $\frac{3}{16}$ -in. to 4-in. and Nos. 1 to 22.

Brass wood screws—both countersunk and round heads are made.

Brass screw hooks, and brass cup hooks—the latter are best, as they have a circular base to the hook portion. Cup hooks made in lengths $\frac{3}{4}$ -in. to $1\frac{1}{2}$ -in. Screw hooks in lengths $1\frac{3}{8}$ -in. to $4\frac{3}{4}$ -in.

Black bolts, square heads and nuts, $\frac{1}{2}$ -in., $\frac{5}{8}$ -in., and $\frac{3}{4}$ -in.

Also made with hexagon heads and nuts. Also galvanized.

Round and square washers.

GLOSSARY

Adze. A traditional tool for the rough squaring and surfacing of large timbers. It has a cutting edge at right angles to the handle, and in use shaves chips from the surface of the wood.

Aggregate. Solid and chemically harmless material used with cement to make concrete. There are fine and coarse aggregates : sand is the most commonly used fine aggregate, and broken brick and stone, shingle and crushed granite, breeze and furnace clinker are coarse aggregates.

Air Brick. A perforated brick built into a wall to allow air to pass through. Used under timber ground floors, and also as vents to rooms.

Aluminium Alloy. Aluminium with admixture of other metals, chiefly copper and zinc. Widely used for architectural metalwork and interior fittings on account of high resistance to corrosion and ease of manipulation.

Anodizing. An electrical process by which aluminium is given a protective and decorative finish of aluminium oxide. It is a hard, durable glaze of high polish and any desired colour.

Arch. A structural feature of wedge-shaped bricks or blocks arranged as a segment of a circle. Effect of the load carried is to compress the arch units, and a side thrust at the supports is thereby created.

Architrave. A projecting strip or moulding framing a doorway or window, covering the junction of wall and frame and providing an ornamental finish.

Asbestos-cement. A combination of fibrous asbestos and Portland cement highly compressed in manufacture. Not affected by exposure and does not require painting ; continues to harden with time and is very durable though rather brittle. Can be drilled and sawn. Widely used for flat and corrugated sheets, roof decking, decorative wall and ceiling linings, rainwater gutters and pipes, water pipes, lamp standards and various moulded goods.

Ashlar. Stonework facing, the blocks being accurately shaped to dimensions with square corners and smooth plane faces.

Baffle. A contrivance for interrupting the natural flow of air.

Baluster. Vertical piece or unit used in a stair balustrade.

Balustrade. Framing, railing or panelling erected at side of stairs and landings for protection ; finished with handrail.

Barge Board. Board fixed along the incline of a gable to cover the projection of the roof. Traditional types often highly ornamental. Modern types plain.

Batten. Strip of wood, as used for ground to which wallboard joinery, etc., is fixed. Also roofing lath.

Bedding. Mortar spread to receive brick, block, floor tile or wall tile.

Bed Joint. Horizontal mortar joint in brickwork and masonry.

Bevel. Surface sloping in relation to another and larger one. In roofing the cuts at feet and heads of rafters, etc., are termed bevels.

Birdsmouth. A triangular notch cut in a piece of wood, used chiefly in pitched roofs to frame rafters to wall plates and purlins.

Bituminous Felt. Fibrous material impregnated with bitumen and rolled into sheets for roofing and flexible damp-proof courses. It is waterproof and durable but must be protected from mechanical damage. A reinforced bituminous felt is made for use where high resistance to tearing is required.

Bituminous Mastic. A waterproof material of a soft plastic nature used in making watertight joints, pointing and repair work. It retains some ductility for a long time and does not shrink.

Bituminous Paper. Paper of strong type impregnated with bitumen. Used as underlay for roof and behind weatherboarding as a cheaper substitute for bituminous felt. Also used for covering concrete to retard drying, and between concrete and ground to prevent chemical infiltration.

Blister, Paint. Raised circle of paint film caused by moisture under the paint or by heat.

Block. Any walling unit larger than an ordinary brick but not so large as a panel. Solid and hollow blocks are made of burnt clay, concrete and lightweight concrete.

Bolection Moulding. A panel moulding that overlaps and stands forward from the face of the framing.

Bond. The overlapping of bricks or blocks in an orderly arrangement designed for strength and appearance. **English Bond** has one course of stretchers to one course of headers, alternating. **Flemish Bond** has alternate stretcher and header in each course. **English Garden Wall Bond**, sometimes called Three-and-one Bond, has one course of headers to three courses of stretchers. **Header Bond** consists of all headers in every course with a $2\frac{1}{4}$ -in. side lap. **Stretcher Bond** consists of all stretchers in every course with a $4\frac{1}{2}$ -in. overlap.

Brace. A diagonal framing member placed to prevent sagging or other movement of the main frame. Used in ledged and braced doors and gates and in timber framing generally.

Brick-on-edge Course. Bricks laid on the 3-in. edge so that the end is exposed on the face in an upright position, the course being $4\frac{1}{2}$ in. thick. Widely used over heads of doors and windows, for copings and projecting ornamental courses.

Bulkhead. Boxed structure sometimes built on upper floor over back of staircase well to give sufficient headroom underneath.

Buttress. Projection bonded to a wall, diminishing upwards, and designed to strengthen the wall, especially against an outward thrust.

Bye-laws, Building. Regulations regarding the design and construction of buildings made by local authorities under the sanction of the Ministry of Health. The Ministry issue printed Model Bye-laws—Urban and Rural Series.

Came. The I section strip lead used in leaded lights, the glass fitting into the grooves of the comes. Copper comes are also made.

Capillary Movement. The movement of water up a small-bore tube or through the gap between two surfaces narrowly separated. The movement can take place against the force of gravity and is the means by which water penetrates porous materials, cracks and narrow gaps in structures. The movement can be checked by either sealing or by widening the gap.

Carriage Piece (or Carriage Bearer). A sloping beam fixed underneath wide stairs on the centre line, and having bracket pieces fixed to it to provide support for the middle part of the steps. Not always used in stairs under 3 ft. wide.

Casement. Hinged window, wood or metal frame.

Casement Door. A door, the major part of which is glazed, combining the functions of door and window. The description is now widely used instead of the older French Window.

Cavity Wall. A wall of bricks or blocks built in two separate thicknesses or leaves with a cavity between, the leaves being connected by ties so designed that water cannot creep across. Properly constructed, a cavity wall is damp-proof.

Cements. Materials, usually powders, which when mixed with water have adhesive properties and set hard. Normal Portland cement sets in half an hour but takes some days to harden and gain strength. Rapid-hardening Portland cement differs from normal Portland in being very finely ground, which allows it to harden more rapidly than the normal type. Aluminous cement hardens very quickly and becomes as strong in 24 hours as normal Portland cement does in 28 days.

Chalking, Paint. Decay of white lead paintwork resulting in reduction to fine white powder which can be rubbed off the surface. Atmospheric impurities with moist conditions tend to cause this trouble. A coat of outside varnish will prevent it.

Chimney Breast. The enclosed structure of brickwork, masonry or concrete between ground and roof containing the flues.

Classic Architecture. Style of architecture used in ancient Greece and Rome and revived throughout Europe in the seventeenth, eighteenth and nineteenth centuries. The column, beam and semi-circular arch in stonework form the structural basis.

Classic Orders. Classic architecture is divided into distinctive types or orders: Doric, Tuscan, Ionic, Corinthian and Composite, each with characteristic features.

Cleat. (1) A strip of wood, usually grooved and glued, so fixed as to cover end grain, as at the ends of drawing boards. (2) An appliance used to exert pressure to a glued joint during the setting of the glue.

Closer. A brick bat nominally $2\frac{1}{4}$ in. wide used next to corner headers to close the end or corner of a wall in a flush vertical surface.

Coping. The top course to the exposed top of a wall designed to protect it from the weather and to provide an ornamental finish.

Corbel. Projection from a wall designed to bear a load.

Cornice. The large horizontal projecting moulding on a wall of a room or façade. Also applied to a moulded feature above doors or windows.

Counter-batten. Batten or length of narrow wood to which the laths or ordinary battens are fixed at right angles.

Cove. Curved junction between wall and floor or wall and ceiling. A plaster cove is often used to provide an ornamental line where the wall joins the ceiling. A coved skirting is often fixed at the base of the wall, especially in floor and wall tiling.

Cramp. A piece of metal with bent ends used to secure two stone blocks from movement. Another type is used to secure facing slabs to brick or concrete backing.

Crazing. Very fine surface fissures in plastering, rendering and mortar joints caused by slight shrinkage. Crazing is not a source of weakness but is unsightly, though it may be concealed by papering or painting.

Cruck Frame. A pair of curved timbers erected so that the tops meet at an apex. Used in early cottage construction.

Cutting Cylinder. Part of lawn mower, being the shaft with curved cutter blades mounted on it.

Dado Rail. A moulded rail fixed to a wall at the height of the top of a chair back, as ornament and also as a protection of the wall's surface—also called a "chair rail."

Damp-proof Course. A course of impervious material built into a wall to prevent damp rising or descending through it. Damp-proof courses are also sometimes laid in concrete floors and in or on the faces of basement walls to prevent damp passing through.

Datum. A fixed point from which levels are taken or set out. The Ordnance Datum, from which levels are taken on Ordnance maps, is the assumed mean level of the sea at Newlyn, Cornwall.

D.D.T. An insecticide which has powerful and lasting effects in destroying all kinds of insects but is non-poisonous to human beings and animals. Insects are not killed instantly on contact, but paralysis sets in within a short time.

Dog's Tooth. A course of brickwork in which bricks are laid diagonally to produce an ornamental line. A type of carved ornament with pointed "teeth."

Dormer. A window built in a pitched roof.

Dowel. A short piece of wood, metal or slate inserted in holes in two parts

of a structure to hold them from lateral movement. Used to hold the feet of a door frame to a step ; also to join rails and stiles in machine-made doors.

Down-draught. A draught of air coming down a chimney flue and driving smoke and fumes into the room.

Dressings. Sills, plinths, courses, mouldings, etc., of a material different from the main walling material. Usually of stone or pre-cast concrete in brick walls.

Dripstone. A Gothic moulding, hollow underneath, placed over a window or door and so designed that rainwater drips off. Also called a Hood Moulding.

Dry Rot. Growth of fungus on timber, accompanied by rapid decay of the timber. The fungus lives in a damp, ill-ventilated atmosphere.

Drip. A groove in the underside of a projection such as a sill, designed to cause rainwater to drip off clear of the wall below.

Eaves. A projecting finish to a pitched roof with a gutter into which rainwater is drained. Boxed eaves consist of a soffit board underneath and a fascia board on the face.

Efflorescence. White soluble salts deposited on the surface of a wall or solid floor. The salts (Epsom and Glauber's salts) are present in Portland cement and certain brick clays. They are drawn to the surface as damp evaporates and crystallize in a white deposit which can be scraped off, though further dampness and evaporation draw more salts to the surface.

Expanded Metal. Metal sheeting cut and expanded by machinery to produce a grid type of fabric which makes a good lathing for plaster and a reinforcement for concrete.

Fascia. A board secured to the front of a projecting feature. Eaves are often finished with a fascia board.

Fibre Board. Sheets made from shredded wood or vegetable material processed and compressed. There are three main types : low-density board, chiefly used in thicknesses of $\frac{1}{2}$ in. and upwards for insulation ; medium-density board, for lining walls and ceilings ; high-density board. The best type of high-density board is called Hardboard or Reconstructed Wood and is stronger than natural deal. Ordinary fibre boards will not stand damp and are not fire-resistant, but special fibre boards are made with high damp- and fire-resistance.

Fillet. A narrow rectangular or triangular piece of material. A wood fillet is used on a roof at the eaves to tilt the bottom course of slates or tiles. A cement fillet is a covering of cement mortar sloping outwards on a small projection.

Filling. Soil and hard, dry ballast, gravel, ashes, etc., used to fill up ground to raise the level.

Final Set. The completion of chemical action in a cement mix.

Flashing. A strip of lead, zinc or copper used to cover the abutment of a roof, canopy, cornice, etc., against a wall or chimney. The top of the flashing is bent at right angles so that the edge can be turned into a bed joint in the wall and then wedged and pointed.

Flat Oil Paint. An oil paint which dries with a matt finish, without any gloss.

Flaunching. Cement mortar finish to the top of a chimney, sloped outwards, for weather protection.

Flemish Bond. See Bond.

Flush Door. Door with continuous plain surface, with a sheet of plywood each side on a built-up core.

Formwork (or **Shuttering**). The wood or metal sheeting with framing used to provide temporary support for concrete. When the concrete is sufficiently strong temporary formwork is removed. Permanent formwork is the term given to sheeting which is left in position as a facing to the concrete.

Footings. Projections at the base of a wall designed to spread the load over an area greater than the wall plan area.

Foundation. Concrete or other base on which a wall, pier or column rests. The subsoil surface on which the concrete foundation is laid is called the **Natural Foundation**.

French Window. Term loosely used to describe a glazed door. See Casement Door.

Fresh Air Inlet. An opening to the house drains, situated at the point where the drain leaves the property to pass under the public road, having a grid to protect it from leaves, etc. Fresh air enters the inlet, passes up the drain and carries foul gases out through the vent pipe at the head of the drain. Also an opening in a wall designed to admit fresh air.

Fumigation. Process of killing pests in a building by filling the rooms with poisonous gas. It should be carried out by skilled persons only.

Gable. Triangular area of walling between eaves and ridge levels at the end of a pitched roof which is not hipped.

Galvanizing. Deposition of zinc on a surface of iron or steel to rustproof it. The hot-dip process commonly used consists of the immersion of the cleansed metal sheet or component in molten zinc.

Glazing Bar. A bar of wood, metal or pre-cast reinforced concrete with rebated edges supporting sheets of glass. The ordinary wood glazing bar is puttied after the glass is fixed and held by glazing sprigs. There are various types of putiless glazing bars, with lead, zinc or copper caps instead of putty.

Going. The distance from the nose of a stair tread to the riser at the back, measured horizontally.

Gothic Architecture. Style of architecture used from the Norman era to the sixteenth century, seen at its best in old churches and manor houses. Structural details in masonry include the pointed arch, vaulting, window tracery and heavy external buttresses. Much half-timbered work in old cottages and houses belongs to the latter part of the Gothic period.

Gradient. A regular slope in a straight line.

Granolithic. A hard concrete in which granite chippings are used as aggregate resulting in a very hard wearing surface. A cement hardener should be added for maximum hardness and non-dusting. Granolithic is usually laid in a thickness of $1\frac{1}{2}$ in. as a flooring on an ordinary concrete base.

Grout. A mortar containing so much water that it can be easily poured, and so can be used to fill spaces inaccessible to ordinary mortar.

Gutter. A grooved section designed to gather and convey water, especially rainwater. An eaves gutter is of metal or asbestos-cement fixed to catch roof-water.

Halved Joint. Corner and crossing joints between two pieces of wood, each piece being notched and the notches fitting into one another, the surface of the two pieces being continuous.

Hardboard. A highly compressed wood fibre board as strong as natural wood and free from faults, produced in sheets.

Harling. A type of roughcasting. Paint harling is a modern treatment for steel sheeting exposed to the weather. Granite chippings are coated with paint and thrown on to a wet paint surface. The treatment is durable and decorative.

Header. A brick laid so that the end appears on the wall face.

Herringbone Pattern. Bricks laid to a zigzag diagonal pattern. Used in panels in timber-framed buildings and also in brick paving.

Hip. The external angle of a roof which occurs where the end of the roof slopes as well as the front and back. On a plain rectangular roof all four sides slope and there are four hips. A **Hip Rafter** is fixed at each external angle and jack rafters are bevelled against it. In tiling the hip is covered with **Hip Tiles**.

Hood Moulding. See Dripstone.

Horn. Horizontal projection of head and sill of window or door frame. The horn is usually bevelled at the end so that it can be built into the wall but concealed from view.

Housing Joint. A recess or groove in one piece of wood into which the end of a second piece can be fitted.

Hydraulic Lime. A lime which sets and hardens after mixing with water. Many limes are only slightly hydraulic and make weak mortars, but some are strongly hydraulic.

Initial Set. The time taken for a cement mix to commence hardening. With normal Portland cement the initial set occurs in about 30 minutes, and if the mix is disturbed thereafter the strength will be seriously impaired.

Insecticide. A chemical which is poisonous to insects.

Inspection Chamber. A brick or concrete chamber, underground, with an airtight cast-iron cover and frame. The drains run through the chamber in the form of half-diameter pipes, so that on removing the cover they are open to inspection and rods can be passed up the pipes to remove an obstruction. Inspection chambers are usually placed at junction points and sharp bends.

Insulating Material. Any material which does not readily conduct either heat or sound. Generally, insulating materials are of low density and of cellular structure, air being enclosed in the cells.

Insulation. Thermal insulation is insulation against heat or cold; sound insulation, against sound waves.

Interface. The plane on which two contacting surfaces meet, as between mortar and brick, paint and wood, etc.

Jamb. The sides of a wall opening; the sides of a fireplace opening; the upright members of door or window frame fixed against the wall jamb.

Jointing. The fixing together of two pieces of wood or other material. The surface finish of walling joints when this is done as the work proceeds and not separately applied.

Key. Term used in plastering to denote surface to which plaster will strongly adhere, such a surface being either rough, grooved or of mesh formation.

Keystone. The centre stone unit of an arch.

Laminated Board. Thick boards built up, with a core of narrow strips of wood placed edgewise and glued together and faced on both sides with plywood, so that large sheets of considerable strength, free from warping and bending, can be obtained.

Lap. The dimension by which one piece of material covers another. In tiling and slating the Lap is the cover of one tile or slate over the head of the second course below.

Lath. Strip of wood about 1 in. by $\frac{1}{4}$ in. Strips nailed to joists or studs with spaces $\frac{3}{8}$ in. between form a key to which plaster will adhere. Metal lath consists of steel sheets cut and expanded (Expanded Metal).

Lime. A compound made by heating calcium carbonate (chalk). Preparatory to use in mortar or plaster, lime is mixed with water and then gives off heat. Strong hydraulic limes set hard. Hydrated lime has poor setting quality.

Lime-cement Mortar. Made with a mixture of hydrated lime, Portland cement and sand. Not so strong as cement mortar but works easier off the trowel and does not shrink so much.

Line. Length of string or thin cord with a steel pin attached to each end. Stretched from corner to corner of a brick wall and levelled, it provides a guide for bricklaying. Can also be used in setting out foundations and garden work.

Lug. A piece of metal fitted to a frame and projecting so that it can be built into a wall.

Meeting Rails. The top rail of a bottom sash and the bottom rail of a top sash which meet when sliding sashes are closed.

Metal Trim. Pressed sheet metal skirtings, picture rails and door linings.

Mitre. Joint between two pieces of wood meeting at corner with the ends of both pieces cut at 45 degrees.

Module. A standard or unit for measurement; term used in prefabricated

and sectional construction for the basic unit on which dimensions of rooms and parts are based.

Mortice. A recess or hole cut in wood or other material to receive the tenoned end of another piece.

Mortice and Tenon Joint. Joint in which one member is morticed and the other is tenoned. See also Mortice ; Tenon.

Mullion. An intermediate vertical member in a window frame, especially applied to stone mullioned windows.

Newel. A post used in stair construction. There is a newel at the foot of the stairs and another at the head on the open side, the balustrade being fixed between them.

Nib. Slight projections at the back of roofing tiles enabling the tiles to be hung on wood battens.

Nogging. Short piece of wood fixed between studs or uprights of timber partition or wall frame, intended to stiffen the frame.

Notching. Recess cut in piece of wood to receive another piece.

Parapet. Portion of a wall rising above the roof.

Partition. Screen or division between two or more rooms. A load-bearing partition must be of strong construction and is usually a partition wall $4\frac{1}{2}$ in. thick. A light partition is non-load-bearing and may be of timber framing or hollow blocks.

Panel. A sheet, wide board or slab fixed in grooves in posts, styles or rails.

Peg. Piece of wood driven into hole passing through a mortice and tenon joint to hold the joint together.

Perpend. Vertical joint on the face of a wall.

Pier. Projection on a wall serving to strengthen it. Also a separate column of brick, stone or concrete.

Pier and Panel Construction. System by which loads are carried on columns and the space between is filled with non-load bearing panels.

Plastics. Group of synthetic resin compounds. There are many kinds with many applications in building construction and equipment.

Plate. Horizontal timber fixed to provide a level bearing to support other members such as floor and ceiling joints, and rafters.

Plinth. A slight projection from the main face of a wall extending a short distance above ground to form a base line to the wall. In some plinths there is no projection, but the material is different from the main walling.

Plug. Piece of suitable material inserted in wall to enable a nail or screw to be driven into it. Old type plug is merely a piece of wood wedged into a wall joint. Patent fibre, metal and composition plugs are now widely used for screw fixings.

Plumb. To be truly vertical. Plumb rule has line with brass or lead plumb bob which hangs in a recess down the side of the rule. It is used for testing surfaces for the true vertical.

Plywood. Thin sheets of wood glued together, adjacent sheets having grain at right angles to one another. Ordinary plywood is glued with ordinary glue. Damp-resisting plywood is cemented with a resin-plastic cement which is unaffected by moisture. Plywood is obtainable faced with veneers of hardwood, metal and sheet plastic.

Pointing. Mortar finish to face of wall joints. Joints are raked out to depth of at least $\frac{1}{2}$ in. and pointing mortar applied with trowel.

Pre-cast Concrete Products. Products such as steps, sills, blocks and slabs, made by casting in moulds. Now widely made in specially equipped factories, the wet concrete being vibrated in the mould to ensure maximum density and expel air bubbles. Many products are reinforced to prevent fracture and cracking.

Prefabrication. Production of buildings in a factory, using machine methods. The prefabricated parts are then delivered to the site and the sections rapidly assembled by hand.

Priming. A first coat of paint on bare material. There are special primers for wood, brick and concrete, steel, galvanized surfaces and asbestos-cement.

Quarry Tiles. Clay tiles used for flooring kitchens, etc. Colours are red, russet, blue and buff.

Rebate. A recessed edge, much used in joinery, as in door and window frames.

Reconstructed Stone. A superior type of artificial stone. The natural stone to be imitated is broken up for use as aggregate in a cement mix which is cast in moulds. The surface is tooled.

Renaissance Architecture. Characteristic architecture of the period from about 1550 to 1810 during which the Classic style of architecture was revived, modified and developed. The Georgian style is one development of the period.

Retaining Wall. A wall built to retain a bank of earth.

Rendering. A cement-sand mix spread or rendered over an exterior wall.

Ribbon Development. Building along existing arterial road without spreading development into the back land. This is now controlled by the Restriction of Ribbon Development Act.

Roll. Joint used in metal roofings, the edges of the metal sheets being lapped and turned in a circular shape. The solid roll is made over a rounded wood core. The hollow roll has no core.

Roof Pitch. A pitched roof is one with a pronounced slope, as distinct from a flat roof which has only a slight slope. The roof pitch is the angle of slope.

Rotten-stone. Soft stone reduced to powder. Used with oil in polishing waxed and other surfaces.

Rubble. Masonry walling in which the stones are either very rough or tooled to only a moderate extent. There are many kinds from rough, uncoursed rubble to squared rubble laid in regular courses.

Saddle Bar. A copper bar fixed across leaded lights to prevent buckling.

Sash. A window sliding vertically or horizontally.

Sectional Construction. Method of building in which the main parts are made up in sections and then erected on the site—especially light timber-framed sectional buildings.

Service Pipe. Water supply pipe from the main to the building.

Settlement. Slight sinking of walls due to movement of foundation. Even settlement if not progressive is not harmful. Unequal settlement results in cracked walls and sometimes in bulging.

Shingles. Wood tiles, generally of Western red cedar, which is very durable. Old shingles are of oak and elm. Laid to lap in courses, like tiling.

Screed. Narrow strips of plaster or battens laid on a wall or floor which is to be plastered, rendered or screeded as guides to obtain an even or level surface. The screeds are placed a few feet apart, and when the wet mix is spread between them a straightedge or screeding rule is passed over the screeds to bring the mix to a true surface.

Screeding. A cement-sand mix applied to a floor between screeds to bring it to a true surface for the application of the flooring or paving.

Scrim. As used by decorators, a kind of canvas made of hemp or jute.

Shuttering. See Formwork.

Skew Nailing. To nail diagonally. This is necessary when it is impracticable to nail parallel with or across the grain of the wood.

Side Hung. A window casement or door is side hung when hinged along a vertical side.

Sill. The bottom member of a window frame. Also the bottom member of a timber-framed partition or wall. Also the brick or other surface to the lower part of a window opening.

Sleeper Wall. A low wall under a ground floor which provides intermediate support for the floor joists. It should be honeycombed with narrow openings to allow through ventilation.

Slurry. A semi-liquid mix of cement and water, sometimes used on tiled

roofs and walls as a treatment for a decayed surface, but not generally satisfactory.

Soffit. Underside, as of a canopy, beam, ceiling to bay window, and eaves projection. In boxed eaves the board underneath is called a **Soffit Board**.

Solid Wall. A wall of solid material without cavities, as distinct from a cavity wall or a hollow block wall.

Stile. A main vertical member of a wood framing.

Storey Post. A long newel post used in some staircases. It rests on the ground floor and extends above the landing.

Storey Rod. A batten marked with levels of steps and used in setting out stairs.

Stretcher. A brick laid lengthwise so that the long face appears on the wall face.

String Course. A course of bricks projecting slightly from the wall face.

Stripper. Means of stripping old paintwork. This can be done with a blow-lamp or with a chemical stripper, the paint being afterwards scraped off.

Strut. A framing member fixed to support a load, as in a roof.

Strutting. Herringbone or solid strutting between upstairs floor joists designed to stiffen the floor.

Stucco. A plaster covering on external walls, extensively used in Renaissance and early Victorian buildings. It consists of hydraulic lime plaster protected with oil paint. Cement rendering is now used instead.

Tamping. Consolidation of wet concrete when placing it in position. This is done by tapping or pressing with a piece of wood or metal or a board of suitable shape.

Templet (or Template). A board, sheet or frame cut to an outline or profile and used as a guide in construction, especially in repetition work and work of complicated outline.

Tenon. The end of a piece of wood reduced in thickness to enable it to be fitted into a mortice. The tenon may be secured by wedging, glueing or pegging.

Thermal Insulation. Insulation against the passage of heat. See Insulating Materials.

Terrazzo. A hard flooring consisting of a mosaic of marble chippings spread on a cement mix and rolled in, then smoothed and polished.

Town and Country Planning. Controlled building and road development in town and countryside, under Town and Country Planning Acts, Restriction of Ribbon Development Acts, etc. This is quite apart from the building bye-laws.

Tessellated Tile. Small coloured tile of fine clay, shape usually octagonal, laid to a pattern. Various colours.

Threshold. A length of wood or metal bar fixed to a step in line with the door frame to prevent water being blown under the door from outside or to prevent draught.

Throating. A groove in the underside of a sill, coping or projecting cornice. See Drip.

Tie. A length of wood or metal rod fixed in a frame to take tensile stress, as in a roof, and so prevent movement of the frame. Also a piece of twisted or cranked metal built in at the ends to connect the two leaves of a cavity wall.

Tile Creasing. Two or more courses of roofing tiles built horizontally into a wall, commonly used over brick window heads, and in brick wall copings, the projecting portion being protected by a cement fillet.

Tongue. An edge to a piece of wood reduced in thickness, the projection fitting into a groove in another piece of wood.

Top Hung. A casement hinged to the frame along the top edge and commonly used over a transom.

Torching. Pointing with mortar containing cow hair to the underside of a clay tile roof. The gap between the head of the tile course and the tile above is filled with the mortar, to keep out draught, dust and wind-driven rain and snow. This method is now rarely used, underfelting being more effective.

Transom. A window frame member, horizontal and dividing the height into two parts, so that there is a casement below and another above the transom, the latter being called a transom light. Similarly, a light over a door.

Transverse Bond. The bonding of bricks or blocks across the thickness of a wall so that the inner and outer parts cannot separate. See Bond.

Tread. A step in a staircase—the flat portion only.

Trimmed Joist. Upper floor joists shorter than the normal and jointed to a trimming joist in front of a hearth or stairwell.

Trimmer Joist. Joist of extra thickness to which the trimming joist is joined.

Trimming Joist. Joist of extra thickness to which the ends of trimmed joists are jointed.

Truss. A frame of timber, steel or reinforced concrete used to support roofs over wide spans. Rarely used in house roofs, with the exception of certain prefabricated systems.

Undercloak. A course of tiles or slates bedded under the verge of a pitched roof along the edge of the gable.

Underfelting. Bituminous felt laid under roof tiling to keep out draught, dust and wind-driven snow and rain. Often called **Sarking Felt**.

Underpinning. This term has two applications : (1) the strengthening of a weak foundation by building a new foundation under it ; (2) the support of walls by placing shores and other temporary timbers to take the loads while a wide opening is cut and a lintel inserted.

Valley. The internal angle or line of intersection where two pitched roofs join. A **Valley Rafter** is a rafter in this position. A **Valley Tile** is a tile used to cover a valley.

Vent. Opening in wall, roof or floor to allow air to pass in or out.

Verge. The edge of a roof covering along a gable. The verge usually projects slightly. See Undercloak.

Waterproof. A liquid or powder compound, colourless, used in a cement mix to waterproof it ; or in liquid form for direct application to exterior walls. It waterproofs by sealing the pores of absorbent materials.

Wattle and Daub. Wattle consists of twigs or brushwood woven between straight sticks supported in a timber frame. Daub is a rendering of mud mixed with straw. This was the forerunner of lath and plaster, and was the traditional filling in panels of timber-framed buildings.

Weatherboard. A board with overlapping edges for use as external cladding on timber-framed walls.

Weathering. A top surface with an outward slope to throw off water. Sills and cornices are usually weathered.

Weep Hole. Hole in the lower part of a retaining wall allowing water behind the wall to escape.

Windfilling (also called **Beamfilling**). The wall filling between feet of rafters where they pass through an outside wall at the eaves, the object being to close the roof against dust, rain, draught and birds.

Window Board. A horizontal board inside a window opening fixed on the wall and jointed to the window sill to form a finish.

Wood Trim. Skirtings, architraves, picture rails, etc. See also Metal Trim.

INDEX

- ABSTRACT OF TITLE, I. 63
 ACCIDENTS, domestic, I. 179
 ACCRINGTON BRICKS, I. 98
 ACT OF GOD, I. 63
 ADAM BROTHERS, II. 3, 4
 ADAM, ROBERT, II. 4
 "AGA" COOKER, II. 230
 AIR BRICKS, choked, I. 19, 31; II. 385
 position of, I. 197
 AIR INLETS, adjustable, I. 150
 AIR LOCK in water system, II. 396
 ALUMINIUM, difficulty of soldering, II. 219
 disadvantages of, II. 209
 houses, I. 45
 kettles, repairing of, II. 222
 ALUMINOUS CEMENT, I. 118
 AMPS (amperes), I. 245
 "ANCIENT LIGHTS," I. 92
 ANIMALS, legal questions relating to, I. 86
 ANTS, destruction of, II. 344
 APPLIQUE decoration of cushions, II. 243
 motives, use of in decoration, II. 119, 124
 ARBOURS, construction of, II. 301
 ARCHES, making of, II. 304
 ARCHITECTURE, traditional, I. 6
 ARCHITRAVES, fixing of, I. 181
 ARTIFICIAL STONE, I. 110
 ASBESTOS-CEMENT, I. 40
 corrugated sheets, I. 134
 for interior linings, I. 40, 145
 flue for gas fire, I. 154
 roofings, I. 40, 134, 194
 ASBESTOS CORDS for roof glazing, I. 168
 "ASCOT" GAS WATER-HEATER, I. 226
 ASHLAR-FACED WALLING, I. 107
 ASPHALT damp-courses, I. 98
 for roofs, I. 128
 ASSIGNMENT, DEED OF, I. 63
 ATTIC, evolution of, I. 5

 "BACK BOILERS," comparison of, I. 222
 BACK-TO-BACK GRATE, II. 321
 BAFFLE-BOARD cure for draughts, II. 348
 BALL VALVES, I. 206; II. 394
 silencer-pipe for, I. 208
 BALLAST, I. 123
 BALUSTRADE of staircase, I. 180
 BATHROOM, danger of electric heating in,
 II. 398
 fixings, II. 394
 lighting, electric, I. 257
 and plumbing, maintenance and inspection,
 II. 391
 BATHS AND LAVATORY BASINS, I. 242
 BED-BUG, destruction of, II. 342
 BEDROOM LIGHTING, electric, I. 257
 BEETLE, death-watch, in timber, treatment
 for, I. 199
 furniture, treatment for, I. 199
 BENCH, building a, II. 163
 hook, use of, II. 166
 stop, II. 164
 BEVEL, CARPENTERS', II. 138
 BIRD BATH, II. 305
 BIRD BOXES AND TABLES, II. 306
 BITUMEN PAPER under carpet, II. 326

 BITUMINOUS felt, I. 128, 194; II. 326
 mastic for pointing, I. 21, 129, 131, 158, 188;
 II. 378
 paint, I. 397
 BLACK PIGMENTS, II. 36
 BLACK WALNUT furniture timber, II. 153
 BLISTERED SURFACES, preparation of,
 II. 61
 BLISTERING on old paintwork, II. 69
 on external paintwork, II. 68
 prevention of, II. 61
 BLOCK-BOARD, I. 36
 BLOCK PARTITIONS, I. 145
 "BLOOM" on varnished surface, II. 84
 BLOW-LAMP, II. 62, 220
 BLUE STAFFORDSHIRE BRICKS, I. 98
 BOARD OF TRADE UNIT (B.T.U.), I.
 245
 BOILED LINSEED OIL, II. 38
 BOILERS, cause of explosion of, I. 223
 de-scaling of, I. 223
 maintenance of, II. 390
 independent, flues for, I. 153
 popularity of independent, I. 222
 repairing of galvanized, II. 222
 BONDING in stone walls, I. 107
 BONDS in brickwork, I. 105
 BOOK-SHELVES, making of built-in, II. 176
 BORING TOOLS for metal, II. 211
 woodworkers', II. 133
 BORROWER'S RIGHT UNDER MORT-
 GAGE AGREEMENT, I. 70
 "BOTTLE-TRAP," I. 241
 BOUNDARY FENCES, I. 54
 legal aspects of, I. 89
 BOUNDARY GARDEN WALLS, II. 282
 BRACE, CARPENTERS', II. 133
 BRACE AND TWIST DRILLS for metal-
 work, II. 212
 BRADAWL, using of, II. 135
 BRASS, II. 208
 BRAZING, process of, II. 222
 BREACH OF CONTRACT FOR SALE, I.
 64
 BREEZE BLOCKS, I. 117
 BRICK, early forms, I. 3
 flues, construction of, I. 154
 flues for independent boilers, I. 153
 BRICK-ON-EDGE STEP, I. 125
 BRICK PARTITION WALLS, I. 142
 BRICK STEPS, I. 125
 BRICKWORK, solid wall construction, I. 11
 bonds used in, I. 105
 cavity wall construction, I. 12
 crumbling, treatment for, I. 105
 BRICKWORK AND MASONRY, I. 97
 BRITISH ASSOCIATION STANDARD
 FOR SCREWS, II. 216
 BRITISH STANDARD, "B.S.," protection
 of purchaser by, I. 262
 glazed-ware pipes, I. 233
 Specification for door, I. 171
 BRUSHES, care of paint, II. 56
 painters', II. 55
 recommended for distemper, II. 94
 wallpaper, II. 107
 BUGS, II. 342
 BUILDING BOARDS, I. 140
 BUILDING BYELAWS, I. 72

- BUILDING RESEARCH STATION**, I. 149; II. 331
BUILDING SOCIETIES, advance by, I. 72
BUILDING SOCIETY MORTGAGES, I. 69
BUILT-IN book-shelves, II. 177
 dining-room cupboard, II. 174
 dressing-table, II. 182
 furniture and fittings, II. 169
 wardrobe, II. 170
 window-seat, II. 179
BURNERS, GAS, adjustment of, I. 266
BUTT HINGES, II. 161
BUTT JOINTS, II. 143
BUTTS, rising, I. 176; II. 161
BUYING A HOUSE, explanatory chart, I. 51
BUYING AND SELLING A HOUSE, I. 23, 47, 59
 schedule of vendor's and purchaser's costs, I. 67
CABINET SCRAPER, II. 130
CARPET laying and care, II. 325
 needle for upholstery, II. 224
 repairs, II. 227
 squares and rugs, II. 327
 stair, II. 327
CARPETS, making joins in, II. 229
CASEMENT fasteners, I. 164
 window, device for limiting the opening of, II. 219
CASEMENTS, wood, construction of, I. 156
 standard sizes, I. 158
 metal, standard, I. 161
CAST IRON, brittleness of, II. 207
 difficulty of soldering, II. 219
 flues, painting of, I. 154
"CATHEDRAL" TYPE GLASS, I. 165
CAVITY WALL, I. 13, 161
 construction, I. 12
 exposed position of, I. 97
CEDAR SHINGLES, I. 194
CEILING JOISTS, I. 138
 exposed, not approved under Byelaws, I. 141
CEILING LATHS, spacing of, I. 138
CEILING LINE, when papering, II. 109
CEILING LINING PAPER, how to apply, II. 65
CEILINGS, I. 138
 lined with sheet materials, I. 138
 ornamental details of, II. 3
 painting of, II. 47, 65
 papering, II. 116
 repairing of cracked, I. 139; II. 75
 stained, II. 66, 93, 99.
CELLULOSE FLOORING, II. 322
CEMENT AND CONCRETE ASSOCIATION, II. 272
CEMENT, aluminous, I. 118
 facings, painting new, II. 59
 mastic for decay in stonework, II. 59
 mortar, I. 110
 portland, I. 113
 rapid-hardening, I. 118
 renderings, coloured, I. 117
 surface, painting a crumbling, II. 60
 white, I. 113
CENTRE BITS, use of, II. 134
CENTRE-PUNCH, II. 211, 216
CESSPOOL, house drains carried to, I. 243
CESSPOOLS, cleansing of, I. 94
CHAIRS, repairing upholstery of, II. 225
CHALK LINE, use of, II. 95
"CHARGE BY WAY OF LEGAL MORTGAGE," I. 68
CHARGE CERTIFICATE, I. 65
CHARRING TREATMENT for rot in timber, I. 198
CHEMICAL CLOSET, I. 243
CHICKEN COOP, II. 363
CHICKEN HOUSES, II. 357
CHIMNEY, I. 151; II. 380
 construction, I. 148, 149, 152
 down-draught in, I. 147
 pots, I. 151
 pots, anti-down-draught, I. 153
 sweeping, II. 381
CHIPPENDALE, II. 23
 furniture, II. 3
CHISELS AND GOUGES, II. 135, 148
CISTERN, cleaning and inspecting, I. 217
 overflowing of, I. 207
 separate, reason for, I. 205
 storage, insulating to prevent freezing, I. 205
 W.C., flushing, I. 209, 215; II. 394
CITIES AND TOWNS, development of, I. 7
CLASSIC ARCHITECTURE, I. 6
CLEARCOLE, II. 92
CLOSET, CHEMICAL, I. 243
CLOTHES AIRER, light, II. 191
CLOUT NAIL, II. 157
COACH-SCREW, I. 159
COAL-TONGS, making a pair of, II. 217
COCKROACHES, destruction of, II. 344
COLD CHISEL, for metal work, II. 211
COLD FRAMES, garden, II. 373
COLOUR and design, II. 13
 harmony, II. 9
 rhythm in, II. 7
 scheme for a typical room, II. 6, 22
COMBINATION GRATES, II. 318
COMPO WORK, dampness in, II. 68
COMPOSITION FLOORINGS, I. 119, 123
CONCRETE, I. 112
 beam units for upper floors, I. 122
 blocks, I. 117
 blocks, standard size of, I. 118
 fences, II. 287
 flat roof, I. 130
 floor, thickness of, I. 116
 garden pools, II. 308
 houses, I. 112
 ingredients, measuring box for, I. 114
 in prefabricated construction, I. 112
 in situ, I. 112
 light-weight, I. 40, 117
 cellular, I. 41
 no fines, I. 41, 117
 paths, I. 116; II. 273
 raft foundation for weak ground, I. 102
 shuttering, I. 39, 115
 slabs, making of, II. 272
 steps, I. 124; II. 277
 tiles for roofs, I. 129
CONDENSATION in glazed structure, I. 189
 on interior window, I. 157
CONDUIT SYSTEM OF ELECTRIC WIRING, I. 245
CONVEYANCE, DEED OF, I. 63
COOKER, "Aga," II. 320
 portable, II. 316
 kitchener, II. 313
COOKERS, care of gas, I. 267
 electric, I. 253
COPING SAW, II. 132
COPINGS AND PARAPETS, I. 104
COPPER flashing, I. 104
 pipe, repairing burst, I. 216
 roofing, I. 129
 soldering of, II. 220
 to soften, II. 209
COTTAGE, the early, I. 1
COUNTERSINKING BITS, II. 216
COUNTERSUNK SCREW, II. 158
"COUTRAI-DU-NORD" TYPE INTER-LOCKING TILES, I. 136
COVENANT, BREACH OF, I. 84
COVERS, LOOSE, II. 231
CRAMPS, WOODWORKERS', II. 166

- CRUCK TIMBER FRAME OF EARLY HUT, I. 2
- CRAZY PAVING, II. 271
- CRICKETS, destruction of, II. 345
- CUPBOARD and shelf fitment, II. 196
for dining-living-room, II. 173
making of built-in, II. 175
- CURB, WOODEN, making of, II. 200
- CUSHIONS and pads for head, II. 242
arranging of, II. 241
round, II. 242
appliqué decoration of, II. 243
- DAMP SURFACES, treatment of in decoration, II. 80
- DAMP-PROOF COURSE, I. 19
height above ground level, I. 24, 97
above roof, I. 104
for glazing structures, I. 185
- DAMP-PROOFING WALLS, I. 31
- DAMP WALLS IN MODERN HOUSES, I. 27
- DAMPNESS, I. 23, 27; II. 380, 385
- D.D.T. INSECTICIDE, II. 338, 341, 343
- DEAL, types of, II. 152
- DECORATION, II. 1
causes and cures of faults in, II. 65
design in, II. 22
harmony in, II. 26
- DECORATIONS IN HOUSE PURCHASE, I. 55
- DECORATIVE PURPOSE OF PLYWOOD, II. 154
- DECORATIVE SURFACE FINISH FOR CONCRETE, I. 116
- DEED OF CONVEYANCE, I. 65
- DESIGN IN DECORATION, II. 22
- "DEXTRINE" PASTE, use of, II. 109
- DISTEMPER, II. 91
applying washable, II. 96
brushes, II. 94
consistency of, II. 98
colours for mixing, II. 92
faults and hints, II. 98
size-bound, II. 91
satisfactory brands of, II. 96
stencilling on, II. 95
tints, modifying of, II. 99
variations of texture, II. 97
washable oil-bound, II. 96
- DISTEMPERING, use of lining paper when, II. 97
walls of outbuildings, I. 192
- "DISTRICT HEATING" HOT-WATER SYSTEM, I. 219
- DOGS ACT, 1906, I. 87
- DOGS (AMENDMENT) ACT, 1928, I. 87
- DOMESTIC BOILERS, I. 223
- DOOR, fitting a threshold to, I. 175
fittings, I. 176
frames and linings, I. 173
frames, how to repair, I. 173
furniture and locks, II. 384
interior linings, I. 174; II. 384
panels shrinking, treatment for, I. 172
- DOOR-LOCK SPRINGS, II. 223
- DOOR-LOCKS, repairing spring in, II. 222
- DOORS, II. 388
flush, I. 171
ledged and braced, I. 170, 172
modernizing of, I. 20
painting of, II. 48
panelled, I. 171
rising hinges for, I. 176
repairing, I. 172
simplest type of, I. 170
weatherproofing, I. 175
and carpets, I. 176
and interior joinery, I. 170
and windows, II. 397
- DOORWAY, cutting opening for, I. 143
in a stone wall, I. 108
- DOVETAIL JOINT, the common, II. 149
- DOWELS, use of, II. 143
- DOWELLED JOINTS, II. 144
- DOWN-DRAUGHT in chimneys, I. 147
special chimney-pots for, I. 153
- DRAIN rods, I. 235
stoppages, I. 235
- DRAINAGE, I. 229
gulleys and traps, I. 237; II. 394
in country districts, I. 243
- DRAINING BOARDS AND CUPBOARDS, II. 194
- DRAINING RACK, making of, II. 185
- DRAINING WET GROUND, II. 266
- DRAINS, how to locate old, I. 235
ventilation of, I. 233
- DRAUGHT, II. 384
excluders, II. 349
- DRAUGHTS in houses, II. 346
prevention of, II. 350
treatment to prevent, II. 348
- DRESSING-TABLE, making of built-in, II. 181
- DRILLING, appliance for, II. 212
- DRILLS, repointing of, II. 215
- DRY ROT, I. 31, 196
- DUTCH STACK PROCESS OF MAKING WHITE LEAD, II. 33
- DYES for water stains, II. 85
- EAVES, I. 130; II. 379
gutters, II. 379
- EBONY STAIN, receipt for, II. 89
- EFFLORESCENCE, II. 375
- "E.J.M.A." WINDOWS, I. 160
- ELECTRIC and gas fittings, II. 389
cookers, I. 253; II. 389
driven mowing machine, II. 353
floor standard lamp, II. 201
fuses, I. 246
lighting, planning for efficiency, I. 255
meter, I. 259
geysers, I. 226
immersion heaters, I. 226
light fittings, making, II. 201
light fittings, care of, I. 258
- ELECTRICITY, cost of, I. 260
"power" connections, I. 246
Services, I. 244
sheathed cable wiring for, I. 246
tracing and repairing faults, I. 249
wood casing wiring for, I. 246
- ELIZABETHAN period of building, I. 6
strapwork, II. 2
- ENAMELS, II. 46
- ENCAUSTIC TILES, II. 329
- ESTATE AGENT, services of, I. 59
- ESTATE DUTY, I. 95
- ESTATE HOUSES, I. 27
- EXECUTORS, I. 95
- EXPANSION PIPES, I. 16
- FELT UNDERLAY, advantage of, II. 326
- FENCES, GATES AND HEDGES, I. 54;
II. 283
- FENCING, legal aspects of, I. 90
- FIBRE BOARDS, I. 34, 140
- FILES for metal work, II. 211
- FILING, method of, II. 213
- FINANCE ACT (1918), I. 76
- FIRE, compensation for, I. 63
damage, tenant to repair, I. 84
damage without ignition, I. 78
insurance, I. 77
liability for, I. 88
provision for escape in case of, I. 73

- FIREPLACE**, II. 381
and flue construction, I. 148
laying of carpet round a, II. 229
- FIREPLACES AND CHIMNEYS**, I. 147
- FIRES**, "lighting back" of gas, I. 268
electric, I. 253
gas, I. 268
- FIRMER CHISELS**, II. 135
- FIRMER GOUGE**, II. 135
- FLASHINGS**, I. 103; II. 380
- FLAT ROOFINGS**, I. 126, 128; II. 380
- FLEAS**, destruction of, II. 343
- FLEX CONNECTORS**, repairing of, I. 250
- FLIES**, destruction of, II. 343
- FLOOR and wall tiling**, II. 329
brad, II. 158
joists, I. 121
of bathroom, II. 397
of greenhouse, II. 369
parquet, renovation of, I. 123
tiles, I. 21, 123; II. 329, 388
ventilation, II. 385
- FLOORBOARDS**, I. 120, 122; II. 381
removal of for wiring, etc., I. 122
rotten, I. 122
- FLOORING**, linoleum cemented down, I. 123
- FLOORS**, I. 119
concrete, hardening the surface of, I. 124
of timber, ventilation by glazed drain pipes, I. 197
solid, I. 123
shrinkage of timber, I. 21, 120
tiled, treatment for, I. 21
ventilation under, I. 120
- FLOWER-BEDS** in paving, II. 257
on lawn, II. 257
- FLUE**, insulation of, I. 151
- FLUE-PIPE** of independent boiler, I. 154
- FLUES**, I. 26
bends in, I. 148
for cooking ranges, II. 314
for gas fires, I. 154
for independent boilers, I. 153
- FLUSH DOORS**, I. 117
- "FOOTPRINT" GRIPS**, use of, II. 212
- "FORCE-CUP,"** blocked sink cleared by use of, I. 240
- FOUNDATIONS** and settlement, I. 100
- FOUNTAIN PUMP**, electrically operated, II. 312
- FOUNTAINS**, II. 312
- FRONT DOORS**, repainting of, II. 60
- FROST DAMAGE TO PIPES**, I. 19, 214; II. 395
- FUELS AND FUEL COSTS**, I. 227
- FURNISHED HOUSE**, letting of, I. 82
- FURNISHING THE GARDEN**, II. 294
- FURNITURE**, making built-in, II. 169
- FUSE**, to repair, I. 248
wire, grades of, I. 247
cartridges, removing of, I. 248
- FUSES**, purpose of, I. 247
- GALVANIZED IRON**, painting of, II. 53
pipes, repairing burst, I. 216
- GALVANIZED WATER PIPING**, when not to use, I. 221
- GARAGE DOORS**, repairing sagging, I. 173
- GARDEN**, II. 251
bench, making a, II. 295
construction, II. 261
frames, II. 373
furniture and summer houses, II. 294
how to measure, II. 252
levelling and gradients of, II. 264
ornaments, II. 301
path making, II. 268
planning, II. 251
pools and ponds, II. 308
- GARDEN roller**, making a, II. 355
setting out, II. 262, 266
site drainage, II. 266
steps, II. 275, 277
table, making a, II. 297
terraces, II. 278
walls, II. 275
wall bond, I. 105
- GAS appliances**, care of, I. 267
and electric water heaters, I. 225
by-pass, I. 267
coke fires, I. 268
consumption, table of, I. 269
cookers, II. 389
fire flues, I. 154
geysers, II. 397
leak, test for, I. 266
mantles, I. 267
meter, housing of, I. 263
pokers, I. 268
services, I. 263
stopcock, I. 263
- GATE FITTINGS**, II. 292
- GATES**, II. 290
concrete posts for, II. 292
fences and hedges, II. 283
- GAUGES**, woodworkers', II. 139
- GEORGIAN COTTAGE**, ground floor plan of, I. 6
- GEORGIAN PERIOD**, I. 7
- "GEORGIAN" WIRED GLASS**, I. 166
- "GILDERS' WHITING,"** II. 91
- GLASS and Glazing**, I. 165
"rough cast," I. 165
amber, tinted to discourage flies, I. 166
bricks, use of, I. 168
"Crown," I. 166
cutting, I. 167
drawn sheet, I. 165
"Georgian" wired, I. 166
modern, II. 21
"New Crown," I. 166
roofs, guards for, I. 187
"Vita," I. 66
- GLAZED ROOFS**, building of, I. 187
- GLAZED STRUCTURES**, defects in, I. 189
- GLAZED WALL TILING**, II. 333, 336
- GLAZED-WARE PIPES**, laying of, I. 234
- GLAZING**, I. 166
bars, I. 168, 186
- GLUE** for draining board, II. 196
to make, II. 167
- GOLD SIZE**, II. 40
- GOUGE**, carpenters', II. 136
sharpening of, II. 135
slip, II. 141
- GRANOLITHIC CONCRETE FLOOR**, I. 119
- GRAPHITE GREASING**, II. 223
- GREENHOUSES AND FRAMES**, II. 365
- GULLY**, clearing a blocked, I. 237
- GULLIES AND TRAPS**, I. 237; II. 394
- GUTTERS**, I. 130; II. 379
box, II. 379
- HACK-SAW** for metal work, II. 211
how to use, II. 215
- HALL**, light in, I. 20
- HANDICRAFTS**, II. 125
- HANDSAW**, II. 132
- HANGING CEILING PAPERS**, II. 116
- HANGING WALL-PAPERS**, II. 112
- HEARTH TILING**, II. 332
- HEAT-RESISTING PAINT** for flues, I. 154
- HEAT-STORAGE COOKERS**, II. 320
- HEDGES**, preparing the ground for, II. 287
fences and gates, II. 283
- HEDGING PLANTS**, varieties of, II. 288

- HELIO-CHRONOMETER SUN-DIAL, II.
305
HEPPLEWHITE, II. 4, 24
furniture, II. 3
HINGES, II. 160
home-made, II. 208
HIP TILES, I. 133
HIPPED ROOF, I. 126
"HOLDFAST" NAIL, II. 157
HOT-WATER boiler, I. 219
cylinder, I. 219, 221
pipes and radiators, painting of, II. 52
services, I. 219
system, II. 396
system pipes, "furring of," I. 217
HOUSE, early development, I. 1
prefabricated, II. 26
structure, I. 98
HOUSES IN EXPOSED POSITIONS, I.
31
HOUSING ACT, 1925, I. 82
HUTS, sectional, I. 193
HYDROGEN CYANIDE (FUMIGATION
OF BUILDINGS) REGULATIONS,
1938, II. 341.
- INCOME TAX, Schedule "A," I. 77
in respect of ownership, I. 76
INSECTICIDES, II. 341
INSECTS, destruction of, II. 340
in timber, I. 199
INSPECTION AND MAINTENANCE
CHART—
Exterior of the house, II. 375
Interior of the house, II. 380
Kitchen, II. 385
Bathroom and Plumbing, II. 391
INSULATING PROPERTIES OF FIBRE
BOARDS, I. 140
INSULATION of cistern, I. 205
thermal, I. 32
INTERCEPTING TRAP, partial stoppage
of, I. 236
INTERIOR JOINERY (general), I. 170
IRON, electric, I. 254
IRON GARDEN GATES, II. 290
IRON PLANE, advantages of, II. 127
IRONWORK, pigments suitable for painting,
II. 52
- JACOBEOAN PERIOD, beginning of, II. 2, 6
JAPAN GOLD SIZE PRIMING, II. 61
JOINTS in masonry, I. 109
in prefabs, I. 45
in woodwork, II. 145, 150
of waste and soil pipes, II. 391
of window frames, I. 157
JONES, INIGO, II. 3
- KEEN'S CEMENT, painting of, II. 66
KETTLES, electric, I. 253
KEYHOLE SAW, II. 132
KITCHEN, lighting, fittings for electric, I. 257
making fittings for, II. 183
storage fitment, II. 192
KITCHENER STOVE, II. 313
KNOTS, treatment of in painting, II. 69
- "LAMINBOARD," I. 36
LAMINATED VENEERED BOARDS, join-
ing of, I. 37
LAMINATED WOOD, II. 154
LAMP BLACK, use of, II. 36
LAND CERTIFICATE, I. 65
LAND REGISTRY, I. 63, 65
LANDLORD AND TENANT, I. 81
"LANDLORD'S FIXTURES," I. 75
"LANDLORD'S PROPERTY TAX," I. 76
LAW AND THE HOUSEOWNER, I. 59
LAW OF PROPERTY ACT, 1925, I. 59, 74
LAWN-MOWERS, II. 351
LEAD PIPE, repairing burst, I. 216
replacement of by copper pipe, I. 213
LEAD roofing, I. 129
soldering of, II. 221
valleys, I. 133
LEADED LIGHTS, I. 167
LEASE, assignment of, I. 84
Covenant, I. 83
stamp of, I. 81
LEASEHOLDER OF LAND, I. 74
LEASES MADE BY DEED, I. 81
LEDGED AND BRACED DOOR, I. 170
LEVELLING SLOPING SITE, II. 264
LICENSEE, LIABILITY OF OCCUPIER
TO, I. 85
LIGHTING, II. 385
LIGHTING, ELECTRIC, avoiding glare, I.
256
circuits, repairing of, I. 250
fittings, I. 256
planning for efficiency, I. 255
LIGHTING FITTINGS, GAS, I. 267
LIGHTWEIGHT CONCRETE, I. 40, 112,
117
LILY POND, II. 311
LIME-CEMENT MORTAR, I. 110
"LINENFOLD" PANELLING, II. 2
LINOLEUM AND RUBBER FLOORING,
II. 321
LINTEL, how to fix a new, I. 174
reinforced brickwork, I. 157
LITHOPONE, II. 34
LOCK SPRING, II. 223
repair to, II. 222
LOCKS AND FITTINGS, II. 397
LOOSE COVERS for car seats, II. 235
for soft furnishing, II. 230
LOUIS XIV STYLE, II. 4
- MAHOGANY, Cuban, II. 153
Honduras, II. 153
stain, receipt for, II. 89
MAINTENANCE AND INSPECTION
CHARTS, II. 375
of house, I. 17
of tools, II. 398
MANHOLES, I. 231
MAPLE STAIN, receipt for, II. 89
MARKING GAUGE, II. 139
MARKING KNIFE, use of, II. 138
MARKING-OUT TOOLS, woodwork, II.
137
"MARSEILLES" TYPE INTERLOCKING
TILES, I. 136
MASONRY, I. 106
MASTIC, asphalt, I. 98
bituminous, I. 21, 129, 131, 158, 188; II. 378
MEAT SAFE, how to make, II. 194
MEDIEVAL ARCHITECTURE, I. 6
MEDIEVAL COTTAGE, ground floor plan
of, I. 6
METAL, EXPANDED, use of, I. 116
METAL lathing, use of, I. 108
trim of interior joinery, I. 183
windows, fixing of, I. 161
METAL-WORK, II. 206
paint mixture for priming, II. 59
preparation for painting, II. 58
METAL WINDOW MANUFACTURERS'
ASSOCIATION, I. 161
METAL WINDOWS in wood surrounds, I.
162
METALS, care of house fitments of, II. 75
employed in the house, II. 206

- METALS for windows, doors, etc., I. 39
 nature and use of common, II. 207
 METER, reading the electric, I. 258
 reading the gas, I. 264
 MICE AND RATS, II. 338
 MINISTER OF AGRICULTURE, I. 89
 MINISTER OF HEALTH, I. 95
 MITRE BLOCK, II. 167
 MODERNIZING VICTORIAN VILLA, I. 20
 MORGAN LEE WALL-PAPER TRIMMER, II. 107, 109
 MORSE DRILLS, use of, II. 135
 MORTAR, LIME-CEMENT, I. 110
 MORTAR for masonry, I. 108
 mixing of, I. 103, 111
 pargetting lining for flues, I. 147
 MORTARS, various, I. 110
 MORTGAGE, main provision of, I. 68
 purchase money by, I. 63
 right to redeem, I. 69
 second, I. 68
 stamping of, I. 71
 MORTICE and tenon joint, II. 147
 chisel, sizes of, II. 135
 gauge, II. 139
 locks, I. 176
 MOSAIC FLOORINGS, I. 123
 MOTHS, destruction of, II. 343
 MOULDINGS, wood, II. 155
 MOWING MACHINES, II. 351
 "MULTIPOINT" GAS HEATER, I. 226
- NAILS and screws, II. 157, 399
 storage, II. 168
 NESTING BOXES, making of, II. 306
 NET ASSESSMENT, meaning of, I. 76
 NEWTON, SIR ISAAC, II. 13
- OAK, English, II. 153
 panelling, introduction of, II. 1
 shingles, I. 136
 squares for floor covering, II. 156
 stain, receipt for, II. 89
 OHMS, I. 245
 OIL PAINT used as preservative for rot in timber, I. 197
 OIL STAINS, applying of, II. 89
 preparations for large quantities of, II. 86
 OIL VARNISHES, II. 44
 OILSTONE, II. 139
 use of, II. 141
 OREGON PINE, II. 152
 OUTBUILDINGS AND SHEDS, I. 191
- PAINT, II. 28
 application of, II. 51
 becoming soft on plaster, II. 67
 blistering, II. 67, 69
 burning off, II. 62
 cissing or crawling, remedy for, II. 70
 composition of, II. 29
 cracking of, II. 31
 darkening on plaster walls, II. 168
 exactitude in mixing, II. 10
 kettles, II. 58
 losing gloss on plaster, II. 68
 mediums, II. 38
 mixing tables, II. 42
 mixture suitable for sea air, II. 70
 peeling from plaster, II. 67
 pigments used in, II. 34
 powdering, remedy for, II. 70
 scaling from ironwork, II. 71
 solvents, II. 63
 PAINTERS' TOOLS, II. 55
- PAINTING, II. 47
 a panelled door, sequence of operations in, II. 48
 external, II. 58
 general problems of, II. 84
 galvanized iron, II. 53
 hard woods, II. 49
 hot-water pipes, II. 52
 ironwork, II. 52
 neglected outside doors, I. 172
 of glazed structures, I. 189
 soft woods, II. 49
 Trade regulations, II. 29
 PANEL pins, II. 158
 repairing a cracked, I. 128
 PANELLING and cut-out schemes in wall-papering, II. 118
 and proportion in wall-papering, II. 119
 linenfold, I. 2
 PANTILES, I. 135
 and plain tiles, comparison of, I. 136
 PAPER HANGING, II. 103, 105, 114
 PARAPETS, II. 379
 and copings, I. 104
 PARING CHISEL, II. 135
 PARTITION BLOCKS, I. 117
 PARTITIONS, I. 142
 brick, I. 142
 fire-proof, I. 143
 plaster on expanded metal, I. 145
 sheeted, I. 145
 timber studded, I. 143
 PASTE for wall-paper, II. 108
 PASTING WALL-PAPER, II. 110
 PATHS, PAVINGS AND DRIVES, I. 117;
 II. 268, 270
 PELMETS, II. 246
 PERGOLAS AND ARCHES, II. 302
 PETRIFYING LIQUID, use of, II. 100
 PICTURE RAILS, II. 381
 fixing of, I. 181, 183
 skirtings and interior joinery, I. 181
 PIERS, GATE, II. 292
 PIGEON AND DOVE COTES, making of, II. 308
 PIGMENTS, black, II. 36
 for oil stains, II. 85
 grinding of, II. 32
 (paints), II. 16
 qualities of, II. 30
 result of mixing, II. 41
 PIPE FIXINGS, II. 394
 PIPE-NAIL, II. 158
 PIPES, burst, emergency repairs to, I. 216
 expansion, I. 16
 exposed, protection of, I. 14, 214
 PIPING CORD, fixing of in cushions, II. 234
 PITCH OF ROOF, I. 14
 PITCH PINE, II. 152
 painting of, II. 49
 PITCHED ROOF CONSTRUCTION, I. 126
 PLANES, II. 126, 144
 PLANS, submitting of drainage system, I. 229
 PLASTER, II. 388
 ceilings, I. 138
 filling for defects in, II. 65
 new, painting, II. 53
 on expanded metal, I. 145
 repainting, II. 54
 surface, filling a bruised, II. 73
 surfaces, distempering, II. 100
 walls and ceilings, I. 138; II. 381
 work, to repair cracks in, I. 139, 276; II. 75
 PLASTERED WALL, PAPERING OF
 NEWLY, II. 78
 PLASTICS, I. 38; II. 21
 PLATE GLASS, I. 165
 PLIERS, II. 212
 PLOUGH, WOODWORKERS', II. 130

"PLUMB BOB," use of, II. 107
 PLYWOOD, fixing to walls, I. 37
 for decorative purposes, II. 154
 for interior lining, I. 140
 kinds of, I. 35
 sheathed, II. 154
 squares, use of, I. 123
 used to face timber studding, I. 145
 veneered, as wall linings, II. 21
 POINTING, I. 19, 102
 round window frames, I. 157
 POOLS AND PONDS IN CONCRETE, II. 308
 PORTLAND CEMENT, I. 113
 compared with aluminous, I. 118
 POSSESSION BEFORE COMPLETION
 OR PURCHASE, I. 64
 POTASSIUM PERMANGANATE, I. 235
 POUFFES, making, II. 243
 POULTRY buildings, II. 357
 house and scratching shed, II. 363
 house, large, II. 362
 house, small, II. 359
 PRE-CAST CONCRETE fences, II. 287
 in prefabs, I. 43
 PRE-CAST PAVING SLABS, II. 271
 PREFABRICATED HOUSES, I. 41
 of pre-cast concrete, I. 43
 of timber, I. 44
 of steel, I. 45
 of aluminium, I. 45
 problems of jointing in, I. 45
 PRESCRIPTION ACT, 1832, I. 92
 PRESERVATION OF TIMBER FENCES,
 II. 286
 PRESERVATIVES FOR TIMBER, I. 197
 PRIVET HEDGING PLANT, choice of, II. 288
 PROPERTY, FIXTURES OF FREEHOLD,
 I. 75
 PROPERTY, FIXTURES OF LEASEHOLD,
 I. 75
 PROPERTY, permissive waste on, I. 83
 voluntary waste on, I. 83
 PRUNING OF HEDGES, II. 290
 PUBLIC HEALTH ACT, 1925, I. 88
 1936, II. 340
 PUNCHES FOR METAL WORK, II. 211
 PUTTY, ingredients of, I. 166

 QUARRY TILED FLOORS, I. 123; II. 329
 QUEEN ANNE PERIOD, I. 7

 RADIATOR, gas, I. 268
 hot-water, I. 225
 RAINWATER and waste heads, II. 391
 gullies, I. 239
 pipes, I. 238
 RAISED TILED HEARTH with fixed curb,
 II. 332
 RANGES and independent boilers, II. 390
 portable, II. 316
 RAPID-HARDENING CEMENT, I. 118
 RATEABLE VALUE, assessment of, I. 80
 RATES, distress levy for, I. 81
 not payable on unoccupied property, I. 79
 payable on temporarily unoccupied premises,
 I. 79
 RATING assessment, objection to, I. 81
 in rural areas, I. 79
 RATS AND MICE, II. 338
 RATS AND MICE DESTRUCTION ACT,
 1919, II. 338
 REBATE PLANE, use of, II. 127
 RECONSTRUCTED STONE, I. 110
 RED CEDAR SHINGLES, I. 136
 RED OXIDE PIGMENT, II. 34

REFRIGERATORS, electric, I. 254
 gas, I. 268
 REGISTERED LAND, I. 64
 sale of, I. 65
 RENAISSANCE ARCHITECTURE, I. 6
 RENT AND MORTGAGE INTEREST
 RESTRICTIONS ACT, I. 64
 REPAINTED SURFACE, causes of blister-
 ing in, II. 61
 RESTRICTIVE COVENANTS, I. 74
 RIBBON DEVELOPMENT, I. 49
 RIGHT OF LIGHT, I. 92
 RIGHT OF WAY, I. 91
 RIM LOCKS, insurance companies unfavour-
 able to, I. 176
 ROLLER, GARDEN, II. 355
 ROOF coverings, II. 379
 eaves, I. 130
 eaves, making rat-proof, II. 339
 glazing, I. 168; II. 380
 greenhouse, I. 371
 hips, I. 133
 inspection and maintenance of, II. 379
 lean-to, leakage in, I. 190
 pitch of, I. 13
 ridged, I. 127
 shingles, I. 136
 tiles, I. 132, 135
 underfelted of, I. 14
 verges, I. 131
 with asbestos-cement slates, I. 134
 ROOFING MATERIALS, I. 128
 ROOFS, I. 13, 25, 126
 flat, I. 28, 128
 leaking, I. 25
 thatch, I. 26
 pitched, I. 126
 ROT AND INSECTS IN TIMBER, I. 196
 ROUGH CAST, fungoid growths in, II. 60
 painting of, II. 60
 ROUTER ("old woman's tooth"), II. 129
 RUBBER FLOORING, I. 119, 123
 RUBBLE WALLING, I. 107
 RUGS MADE FROM WORN CARPETS,
 II. 229
 RUMFORD PRINCIPLES, fireplace de-
 signed on, I. 149
 RUSTIC furniture, II. 298
 poles, stripping of, II. 298

 SAFETY VALVES and boiler explosions, I. 223
 SALE by auction, I. 66
 private treaty, I. 66
 conditions of, I. 62
 SANDSTONES, I. 108
 SANITARY appliance, trapping of, I. 230
 equipment, II. 391
 fittings, chipped, II. 397
 Inspector, I. 229
 SASH cords, method of fixing, I. 163
 chains, I. 164
 windows, I. 162
 windows, painting of, II. 48
 SATIN WALNUT, II. 153
 SAWS, II. 131
 SCAFFOLD BOARDS, II. 57
 SCALE ON INSIDE OF CYLINDERS, I. 222
 SCHEDULE "A" INCOME TAX, I. 76
 SCRAPER, cabinet, II. 131
 sharpening of, II. 142
 SCRAPERS, DECORATORS', II. 63
 SCREEDING WALL SURFACES BEFORE
 TILING, II. 334
 SCREENS AND PORCHES, II. 348
 SCREWS, II. 216
 and bolts, II. 158
 patent plugs for, II. 159

- "SECO" SYSTEM of prefabricated construction, I. 43
SECTIONAL HUT CONSTRUCTION, I. 193
SECTIONAL SHED, I. 192
SEPTIC TANK, house drains carried to, I. 243
SERVICES, I. 201
SETTEE, repairing upholstery of, II. 225
SEWAGE, combined type of, I. 231
SHARPENING edge tools, II. 139
 of mowing-machine blades, II. 354
SHEDS, construction of, I. 193
 clad with asbestos-cement sheeting, I. 194
 clad with corrugated iron, I. 194
 clad with weatherboards, I. 194
SHELVES, II. 183, 388
SHINGLED ROOF DETAIL, I. 137
SHINGLES, I. 136
"SHORT CIRCUIT," causes of, I. 249
SHOOTING BOARD, II. 144
SHUTTERING or formwork for concrete, I. 39, 115
SILICATE OF SODA, I. 117, 124
"SILVER FISH," II. 342
SINK, I. 240; II. 389
SKIRTINGS, I. 181; II. 381
 dry rot in, I. 181
SNOWGUARDS, II. 380
SOIL AND WASTE DOWN PIPES, II. 391
SOLAR SPECTRUM, II. 13
SOLDERING, II. 219
SOLID FLOORS, I. 123
SOLID UPSTAIRS FLOORS, I. 119
"SOLIGNUM," II. 87
SOLVENTS or thinners, II. 38
SOUND INSULATION OF GLASS BRICKS, I. 168
SPECTRUM BAND, II. 14
SPIRIT VARNISHES, II. 45, 83
SPOKESHAVE, II. 130
SPONGE, use of for stippling, II. 97
SPRINGS, repairing broken upholstery, II. 226
SQUARE, CARPENTERS', II. 137
STAINING WOOD, II. 84
STAINS caused by damp, to remove, II. 80
 in plaster work, II. 65
 oil, II. 85
 on carpet, removal of, II. 329
 wood, receipts, II. 89
STAIR balustrade, repairing, I. 180
 carpet, II. 327
STAIRCASES, I. 177
STAIRCASE defects, I. 179
 lighting of, I. 173
 plan of, I. 179
 strengthening, I. 180
 ventilation under, I. 180
STAMP DUTY, I. 63, 82
 costs and fees, I. 67
STEEL, tool, II. 208
 mild, II. 207
 to harden, II. 209
STENCIL WORK applied to distemper, II. 95
STENCILLED WALL-PAPER, II. 103
STEP, repairing a stone, I. 125
STEPS, I. 124; II. 378
 household, making, II. 197
 in garden, II. 277
 terraces and walls, II. 275
 trestles and ladders, II. 57
STILING BORDERS, use of, II. 122
STIPLER, use of, II. 97
STONE facings, painting of, II. 59
 flagged floors, I. 119
 masonry, I. 106
 position of strata of, I. 109
STONE rubble walls, I. 107
 slabs, laying of, II. 270
 steps, I. 125
 walls, I. 107
STONework, water paint for, II. 101
STOPCOCKS, water, I. 203
 gas, I. 263
STORAGE CISTERN, protection of, I. 214
STREETS, cleansing of, I. 95
STRETCHER BONDS, I. 105
STRING COURSES, II. 378
STRUCTURAL MEASURES AGAINST VERMIN, II. 339
STRUCTURE OF HOUSE, I. 97
SUB-LETTING, I. 84
SUMMER HOUSE, II. 299
SUN-DIAL, II. 304
SUN LOUNGES AND VERANDAHS, I. 184, 188
SURVEY OF GARDEN, II. 251
SWITCH adaptor, I. 255
 faulty, I. 250
 main, I. 244, 247, 250

TABLE, making of a collapsible, II. 190
 garden, I. 297
"TALLBOY" POT, anti-down-draught, I. 153
TAP dribbling, remedy for, I. 212
 washers, replacement of, I. 211
TAPE MEASURE, home-made 50 ft., II. 251
TAPS, I. 212
TARMACADAM, II. 275
"TARRAN" SYSTEM of prefabricated wall construction, I. 46
TEAK TIMBER for draining board, II. 195
TENANCIES, terminating of, I. 84
TENANT'S FIXTURES, I. 75
TENON JOINT, I. 146
TENON SAW, II. 132
TEREBENE, II. 39
TERRAZZO floor, I. 119, 123
 tiles, II. 330
TERRACES and retaining walls, II. 279
 sloping, II. 258
 steps and walls, in the garden, II. 275
TESSELATED TILES, II. 332
THATCHED ROOFS, I. 26
"THERM" system of gas supplied, I. 265
THERMAL INSULATION, I. 32
 improvement of, I. 117
 of glass bricks, I. 168
 of walls, I. 32
THERMAL STORAGE WATER HEATERS
 I. 226
THIRD PARTY, HOUSE OWNERS' LIABILITIES, I. 84
TIE-RODS for bulging walls, I. 101
TILE and slate finishing of verges, I. 132
 quarry floor, I. 123; II. 329
TILED FLOOR, I. 119, 123
TILES, INTERLOCKING, I. 135
TILING, "fittings" used in roof, I. 133
 floor and wall, II. 329
 on wood partitions, II. 337
TIMBER, II. 152
 insects in, I. 199
 preservatives, I. 197
TITLE, compulsory registration of, I. 64
TONGUED AND GROOVED JOINTS, II. 144
TOOL kit, II. 398
 rack, II. 168
TOOLS, care of sharp-edged, II. 136
 and equipment, papering, II. 106
 for metalwork, II. 209
 for paintwork, II. 28
 for woodwork, II. 125

TOOLS, general for upholstery, II. 224
 paper-hangers', II. 107
 TRADESMEN'S DELIVERY HATCH, II. 186, 189
 TREE FELLING, liability of owner of, I. 89
 TREES, OVERHANGING, to abate the nuisance of, I. 88
 TRELLIS WORK, fixing of, II. 304
 TRESPASS by animals, I. 86
 TUDOR PERIOD OF BUILDING, I. 6
 TURPENTINE as thinners, II. 39
 TWIST BITS, II. 133

UNDERPINNING FOUNDATIONS, I. 100
 UPHOLSTERY AND SOFT FURNISHINGS, II. 244

VACUUM CLEANERS, I. 254
 VALLEYS, ROOF, I. 133
 VAN GOGH, II. 26
 VARNISH, II. 44
 application of, II. 31, 71, 82
 cause of cracking of, II. 84
 preparing surface for, II. 44
 stains, II. 86
 storing of, II. 82
 used as vehicle, II. 33
 VARNISHING and wax polishing, II. 82
 water paint, II. 102
 VENEER PINS, II. 156
 VENT PIPES, II. 394
 VENTILATION in glazed structures, I. 189
 of sun lounges, I. 184
 under stairs, I. 180
 VENTILATOR, II. 390
 constant flow, II. 348
 VERANDAH or sun lounge, I. 185
 VERMIN, liability of occupier regarding, I. 87
 prevention and disinfection, II. 337
 VICE, metal workers' II. 213
 woodworkers', II. 166
 VICTORIAN HOUSE, I. 8
 VILLAS, I. 17
 "VITA" GLASS, I. 66

WALL bracket, electric, II. 205
 panelling of the seventeenth century, II. 2
 surfaces, adjustment of space of in decoration, II. 5, 9, 11
 tiling, II. 331, 333, 388
 WALL-PAPER, II. 103
 applied over old varnished paper, II. 80
 American, sizes of, II. 103
 cutting, II. 109
 estimating quantity required, II. 104
 hanging, II. 108, 112
 measurement of English, II. 103
 over distemper, II. 78
 panelling with, II. 118
 paste, making of, II. 108
 pasting and folding, II. 110
 "sanitary," II. 103
 stripping, II. 79
 tools for hanging, II. 107
 trimmer, II. 107, 109
 WALLS, I. 10, 24; II. 375
 cavity, I. 13
 cavity, windows in, I. 160
 cracks and crevices in, I. 19
 rendering of, I. 12
 steps and terraces, II. 275
 with imperfect surfaces, II. 66

WARDROBES, making of built-in, II. 171
 WASHING MACHINES, care of electric, I. 254
 WASHERS, tap, I. 211
 for ball valves, I. 208
 WASPS, destruction of, II. 345
 WASTE outlets, II. 391
 pipe, I. 16
 WASTES and outlets, I. 240
 WATER, average consumption of per head, I. 201
 contamination, I. 202
 cistern, cleaning out, I. 217
 hammer, II. 396
 heated towel rail, I. 225
 heaters, gas and electric, I. 225
 heating, fuel costs, I. 227
 heating, curing faults, I. 227
 hot, layout of system, I. 219
 hot, boilers, I. 222
 hot boilers, safety valves, I. 223
 mains service, I. 201
 marks on bath, removal of, I. 242
 softeners, I. 217
 stains, preparation of, II. 85
 storage cistern, I. 201
 supply from wells, I. 218
 supply, layout of, I. 201
 WATER PAINT applied over old paint, II. 101
 as a filler for plaster, II. 102
 distempers, faults and hints, II. 98
 efficiency of, for plasterwork, II. 67
 improved by addition of plaster of Paris, II. 97
 to remove splashes from, II. 101
 washable, II. 96
 WATER PIPES, I. 213
 burst, emergency repairs, I. 216
 draining, I. 215
 emergency repairs to, I. 216
 fixing of, I. 123
 main, suitable depth for, I. 16
 preventing freezing, I. 14, 214
 WATER SERVICE, I. 204
 cold, I. 201
 hot, I. 219
 WATTS, I. 245
 WAX finishes, II. 87
 polishing, II. 84
 W.C. cisterns, I. 209, 215; II. 394
 pan and joint, II. 395
 pans, blockage of, I. 242
 pans, leakage of, I. 243
 WEATHERBOARD for door, I. 117
 WEATHERBOARDING, types of, I. 195
 WEEDS, I. 89
 WELLS, I. 218
 WET ROT IN TIMBER, I. 196
 WHITE LEAD, II. 33
 Dutch stack process, II. 30
 WHITWORTH'S SCREW STANDARD, II. 216
 WINDOW boards, fixing of, I. 181
 fittings, I. 164
 frames, pointing round, I. 157
 frames, box type for sliding sashes, I. 162
 sashes, repainting of, II. 59
 seat, making of, II. 179
 sill, "throating," I. 157
 sills, I. 156, 159
 transom, position of, I. 155
 WINDOWS, I. 158; II. 378, 384, 388
 and doors, repair of, I. 28
 and doors swelling through damp, I. 28
 functions of, I. 155
 steel, rusting, I. 30
 WIRE NAIL, II. 157
 WIRED CAST GLASS, I. 165
 WIRING SYSTEMS, I. 245

WOODS, defects of soft, II. 152

WOODWORK, II. 125

 joints, II. 143

 materials, II. 152

 rot in, I. 18

 tools for, II. 125

 tools, sharpening, II. 139

WORKSHOP and its equipment, II. 162

WREN, SIR CHRISTOPHER, II. 3

WROUGHT NAIL, II. 158

YORK STONE, use of, I. 124

YORKSHIRE DEED REGISTRY, I. 65

ZINC, II. 209

 flashing, I. 104

 painting of, II. 53

 perforated, II. 193

 roofing, I. 129

 soldering of, II. 221

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